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ABSTRACT

The study involving 35 learning disabled children (7 to 10 years old) investigated the relationship of properties of formal lessons and teacher communication to task related attention of the children. Ss in seven resource room settings were observed during three formal lessons for a total of 72 minutes each. During observations, data on lesson types and child behavior were collected every 10 seconds. Every 5 minutes, data on the classroom milieu related to the lessons were coded for role of the teacher, ownership of the task, pupil-work interactions, and source of task pacing. Each formal lesson was audiotaped for subsequent coding of teacher communications to the target child during the lesson. Among conclusions were that a learning disabled child is influenced more by the ecological context of the lesson than by within-child characteristics; that a one to one teacher-child ratio is the most efficacious for learning disabled children in terms of overall achievement gains; that teachers do show objective and quantifiable characteristics in terms of the quantity and structure of their communications to children, and in some cases these communicatons are related to the task enagement of the children they instruct; and that the ecological research model is an effective methodology for studying children. Specific implications of the findings for the remediation of attentional deficits in learning disabled children are addressed and sample record forms are appended. (Author/SBH)

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FINAL REPORT

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THE RELATIONSHIP OF LESSON PROPERTIES AND TEACHER COMMUNICATION TO THE TASK-RELATED ATTENTION OF LEARNING DISABLED CHILDREN

Pamela G. George, Senior Investigator
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Submitted to the Bureau of Education for the Handicapped
Department of Health, Education, and Welfare
Research Branch

July 1, 1978

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PAMELA GALE GEORGE. The Relationship of Lesson Properties and Teacher Communication to the Task-Related Attention of Learning Disabled Children (Under the direction of JAMES J. GALLAGHER).

The study investigated the relationship of properties of formal lessons and teacher communication to the task-related attention of learning disabled children. Thirty-five learning disabled children in 7 resource room settings were observed during three formal lessons for a total of 72 minutes each.

During these observations, data on lesson types and child behavior were collected every 10 seconds. Every five minutes data on the classroom milieu related to the lessons was coded for role of the teacher, ownership of the task, pupil work interactions, and source of task pacing. Each formal lesson was audio taped for subsequent coding of teacher communications to the target child during the lesson.

One major purpose of the study was to examine the relationship between certain types of formal lessons within a resource setting and the task-related attention of the learning disabled children participating in those lessons. Using a summary chi square technique, a significant relationship was found between the six lesson types observed and task-related attention. Additionally, using signal system theory, it was shown that lesson types which exhibited continuous signals from a single emitter promoted more on-task behavior than lesson types which exhibited shifting signals from multiple emitters.

The second main purpose of the study was to examine the effects of certain classroom milieu variables related to the lessons on the task-related attention of the children in the resource rooms. Examination of Teacher-Child Ratio, using a one-way analysis of variance, found a significant relationship between the three ratio groups 1:1, 1:2, 1:3 and on-task behavior. The 1:1 ratio group displayed significantly more on-task behavior than groups 1:2 and 1:3 combined. No differences were noted between ratio groups 1:2 and 1:3.

The third purpose of the study was to investigate the relationship of certain types of teacher communication and the task-related attention of the children observed. It was found, using Pearson Product Moment Correlation Analysis, that the quantity of teachers' Instructional Communication was positively and significantly correlated with children's on-task behavior. No other category of teacher communication--Reactional (reinforcement), Informal, or Managerial--was shown to be related to the children's on-task behavior.

General conclusions were presented concerning the relationship of lesson properties and teacher communication to task-related attention of learning disabled children. Specific educational implications are addressed including modifications of the learning tasks, modifications of teacher behavior, and implications of these findings for the regular classroom. Eight avenues of future research related to task-related attention of learning disabled children and the variables within a learning setting which impact on attention are discussed.

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INTRODUCTION

A wealth of evidence has accumulated in recent years indicating that learning disabled children have difficulty attending to a task. Deficits in attention have been reported by basic researchers examining specific auditory and visual capabilities of these children. Field-based research conducted in educational settings has reported consistent findings that learning disabled children exhibit less task engagement than their normal peers. The evidence, which appears consistent in studies conducted both in the laboratory and the classroom, is so overwhelming that some theorist posit that an attentional problem is the cardinal symptom of learning disabilities (Hallahan, 1978).

Clarifying the role attentional deficits play in learning disabilities, and understanding the effects on attention behavior of remediation program variables, are particularly important at this time for several reasons. First, the incidence of learning disabilities among children in the United States is relatively high. Estimates range from 1% to more than 30% of all school-age children (Gearhart, 1977). A fair but parsimonious estimate is around 10%, but the figures would be much higher if children classified as reading disabled were classified under the same administrative funding sources as learning disabled populations (Oxford, 1978).

Second, a large public committment has been made to the provision of special education services to learning disabled children in the form of the education for All Handicapped Children Act of 1975 (Public Law 94-142). Additionally, legislation, specifically for the provision of specific resources for learning disabled children, have come before the House and Senate of the U.S. Congress (Kirk, 1972; Gearhart, 1977). In 1969, nearly $80,000,000 were allocated by Congress for the education of handicapped children--almost $7,000,000 of that money was allocated for the special education of learning disabled children, and these resources have increased at both the federal and state levels every year.

Third, at the request of HEW Secretary Joseph Califano, the National Academy of Education--composed of 50 panel members from education, history, philosophy, political science, economics, sociology, anthropology, and psychology, all focusing on educational practices and problems--identified the four most critical problems contributing to the noted decline in academic performance in the U.S. schools. This panel identified the "slackening of 'on-task' attention" to be the third most critical problem in the U.S. schools (Robinson, 1978). A quote from the panel's report stated:

> If "time-on-task" evidence is analyzed coolly, it argues that any organization of the classroom that keeps time-on-task high will solve the achievement problem. (p.5)

The other three critical problems identified by the panel were, "first, the proliferation of courses; second, confusion about the appropriate role of the teacher; ...and fourth, a dismantling of opportunities for intensive study in selective academic environments" (p. 6).

Fourth, interest in attentional problems of learning disabled children has developed an international scope. Two conferences in the past three years in Denmark (1975) and Germany (1977) have focused on determinates of learning disorders (Meichenbaum, 1977). Critchley (1973) reports discussions stimulated by the World Federation of Neurology in France, Belgium, Germany, Spain, Czechoslovakia, Bulgaria, and Romania related to attentional deficits.

Fifth, in reaction to the need for field-based research on educational programs for children with attentional problems, the Bureau of Education for the Handicapped (BEH) has recently increased its funding of research and development activities to determine appropriate educational procedures for enhancing the academic competence of children with attentional deficits. To date one Learning Disabilities Research Institute at the University of Virginia has been funded (Hallahan, 1978).

Purposes of the Study

The significance of the role of attentional deficits in learning disabilities and the importance of investigating what impacts upon attention of learning disabled children are the concerns of the present study.

This study attempts to elucidate the relationship between certain variables within the behavior setting of the learning environment and a child's attention to the prescribed tasks within that environment. The main purposes of the study are:

1) To examine the relationship between certain properties of formal lessons within a resource setting and the attention to those lessons of the learning disabled children participating in those lessons.

2) To examine the effects of certain classroom milieu settings on the attention of the children in those settings.

3) To investigate the impact of the frequency of certain types of communications from the teacher to the child on the child's attention to the task.

4) To explore the applicability of naturalistic methods of ecological psychology to the study of attention behavior of the learning disabled child and to the study of special education interventions.

The significance of this research rests on the fact that it offers two levels of information:

1) empirical evidence supporting the relationship between classes of lesson and teacher communication variables and attention behavior of learning disabled children;

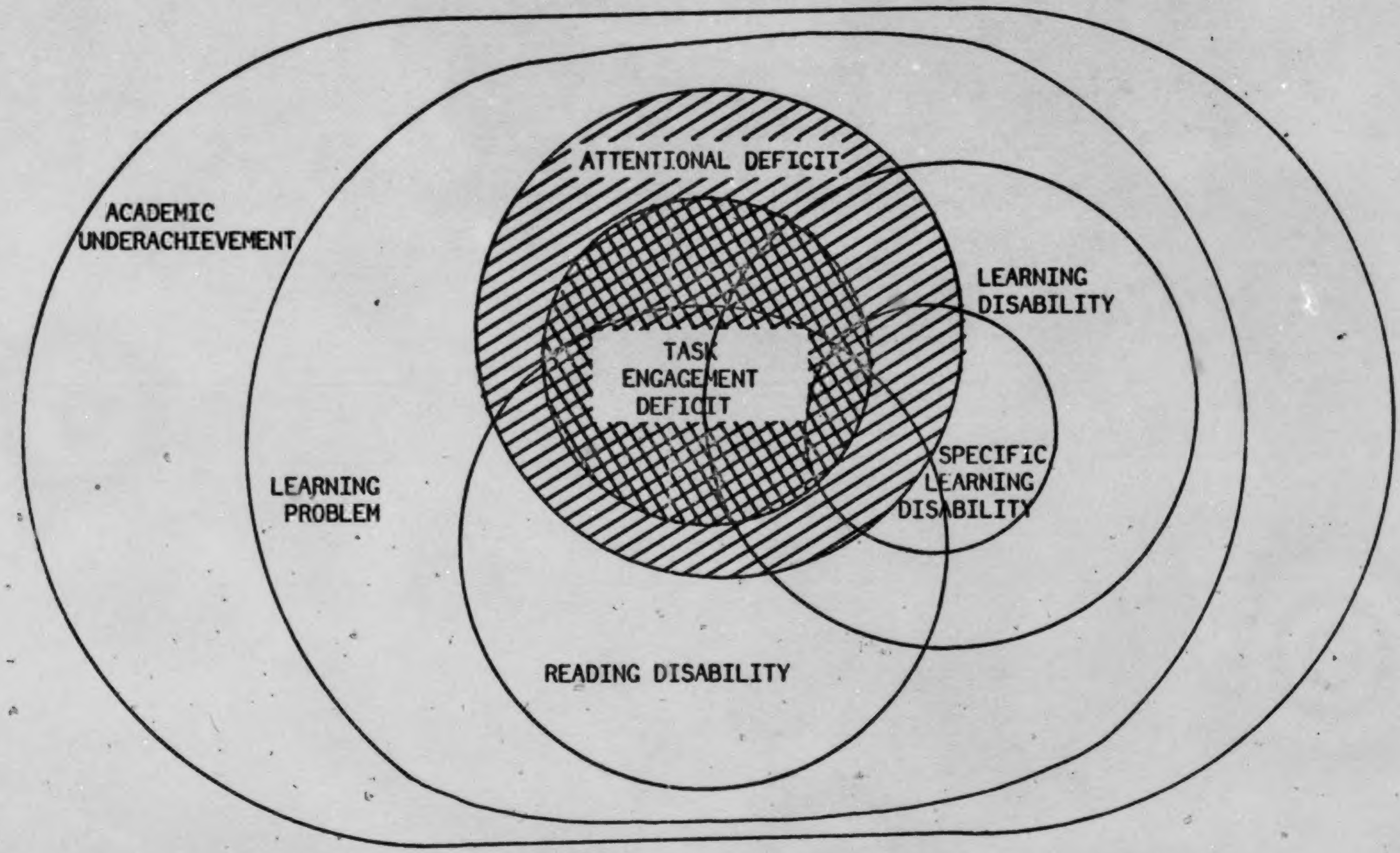
2) implications concerning and suggestions for specific modifications of remediation techniques in the special education of learning disabled children.

A Definition of Terms

The terms to be used throughout this study will be defined in this section and will include expressions related to learning disabilities and attention. The terminology primarily reflects a descriptive, behavioral focus rather than an etiologic focus. Figure 1 illustrates, using Venn diagrams, both the interelatedness of terms used to define learning disabilities and the relationship of attentional deficits to learning disabilities.

FIGURE 1

RELATIONSHIP OF ATTENTIONAL DEFICITS TO LEARNING DISABILITIES



Learning Disability

The general term of "learning disability" was defined as early as 1962 by Kirk.

> A learning disability refers to a retardation, disorder or delayed development in one or more of the processes of speech, language, reading, writing, math, or other school subject resulting from a psychological handicap caused by a possible cerebral dysfunction and/or emotional or behavioral disturbances. It is not the result of mental retardation, sensory deprivation, or cultural factors. (p. 261)

Desiring to be more specific, Johnson and Myklebust (1967) added that concerning the child with a learning disability:

> ...it is the fact of adequate motor ability, average to high intelligence, adequate hearing and vision, and adequate emotional adjustment, together with the deficiency in learning, that constitutes the basis for homogeneity. (p. 82)

In 1968, the National Advisory Committee on Handicapped Children adopted as guidelines the following definition. They attempted to add even more specificity to the definition of learning disabilities (Haring and Bateman, 1969):

> Children with special learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or in using spoken or written languages. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling, or arithmetic.

> They include conditions which have been referred to as dysfunction, dyslexia, developmental aphasia, etc. They do not include learning problems which are due primarily to visual, hearing, or motor handicaps, to mental retardation, emotional disturbances, or to environmental disadvantage.

These definitions are not without problems for educators who provide services to learning disabled children. While it is unrealistic to expect a single definition to hold relevance for many different disciplines (Gallagher, 1966), educators have had to deal with definitions used by neurologists, pediatricians, and other service providers. No totally acceptable definitions have yet been formulated or operationalized. Gearhart (1977) has analyzed many of the definitions presently in use and found that the "discrepancy" definition is the most widely used for identification and placement decisions--i.e., a discrepancy is evident between the actual level of functioning of the child (in reading, math, language development, etc.) and that level of functioning which might be expected considering the child's intellectual level.

Specific Learning Disability

The term "specific learning disability," which is often interchanged with "learning disability" implies that the disability is not a general learning problem, but rather a problem in a specific area within an individual. For example, a child may exhibit normal development, according to Kirk (1972), but he may be completely unable to spell. Because most children in the learning disabilities programs observed in this study have no detailed diagnostic assessments nor are the programs oriented toward delineating specific disability areas, for our purposes these two terms, learning disability and specific learning disability, are synonomous.

Learning Problem

This term is a comprehensive term covering any and all difficulties related to learning regardless of their etiology or administrative label (retardation, disadvantaged, emotionally disturbance, learning disability, etc.).

Brain-Injured/Minimal Brain Dysfunction

The terms "brain injury" or "minimal brain dysfunction" are mentioned primarily because they appear in the historical literature related to learning disabilities. They describe a cluster of symptoms which include inattention, distractibility, impulsivity, hyperactivity, and other possible behavioral disorders (Gallagher, 1957; Strauss and Lehtinen, 1947; Clements and Peters, 1962; Cruickshank, 1961). Though some learning disabilities may be associated with brain injuries, many are not, and the terms should not be used synonomously (Birch, Thomas, and Chess, 1964).

Attentional Deficits

The term "attentional deficit" is used in the literature in a diversity of ways. Some uses imply a unitary phenomena of "attention" which is debated by others who support a more complex and multifaceted view of attention and attentional deficits (Keogh and Margolis, 1976). A more detailed discussion of attention and attentional deficits will follow in the next section.

For our purposes, an attentional deficit is described as a child demonstrating difficulties in maintaining attention to a task. These children do not concentrate on their work, may be distracted from their work easily, orient their eyes or their entire bodies from their assigned work often, and are described by their teachers as having "short attention spans."

Terms used throughout the literature and this study to describe this attentional deficit are: attention problem, inattention, poor on-task behavior, inadequate task engagement, task engagement deficit, poor attention to task, and inadequate task-oriented behavior.

CHAPTER ONE

ATTENTION AND ATTENTIONAL DISORDERS:
Their relationship to the learning disabled child

The concepts of attention and attentional disorders have long, though erratic, positions within the history of psychology. Hallahan (1973) and Boring (1970) traced some of the early experimental attention research and noted its demise during the last half-century, until its recent rediscovery. Concerned with this scarcity of research, Wohlwill (1962) warned his colleagues how important it was to rediscover research in attention and its disorders:

> Attention represents the sine quo non of conceptual functions; the formation of conceptual classes clearly requires the systematic selective and abstraction of relevant...from irrelevant information. The same is true of logical inferences, deductive reasoning, mathematical problem-solving and such manifestations of symbolically mediated behavior. (p. 86)

The role attention plays in conceptual development and learning, Wohlwill warned, had been temporarily overlooked. This neglect has meant that there has been little experimental work on which the applied fields could build. This lack, Douglas observes, is particularly apparent in work with handicapped children (1974).

Historically, experimentalists have tried to define and describe attention, but it has been problems of attention which have preoccupied the applied fields. The "problem" orientation has received particular support from clinicians and researchers working with children with neurological impairment, learning disorders, and emotional disturbances (Keogh and Margolis, 1976). Descriptions of attentional problems were reported frequently in clinical reports of children diagnosed as brain-injured (Gallagher, 1957; Levy, 1959; Ounsted, 1955; Strauss and Lehtinen, 1947; Cruickshank, 1966; and Douglas, 1974). However, the same group of symptoms seemed to be prevalent in children falling into the minimal brain dysfunction category (Comly, 1955; Millichap and Fowler, 1967; Widrow, 1966) and the learning disorder category (Clements, 1966; Dykman, Ackerman, Clements, and Peters, 1971; Harris, 1976; Tarver and Hallahan, 1974; Douglas, 1974). Extrapolations from these clinical samples to children with school learning problems has had a profound and long-term effect on the field of special education--and has made attentional problems a prime suspect in learning disabilities.

Limited theory or evidence is available to clarify the confused relationship between attentional processes and learning failure. Clements (1966) reviewed teachers' referrals, psychologists' reports and physicians' diagnoses and found almost universal agreement on the ten most frequently cited characteristics of children with learning problems. They contained such global terms as "short attention span, distractible, impulsive, hyperactive"--all referring to the learning and behavior patterns of children with learning disabilities. Clinical evidence, research evidence, and common sense support the position that problems of attention impair the learning disabled child's functioning on a wide range of cognitive tasks and in a wide variety of learning and social situations.

Reports in the literature suggest that problems of attention must also be considered as major determinants of the impaired functioning of retarded children (Santostephano and Stayton, 1967; Denny, 1964; Spradlin, Cromwell and Foshee, 1959; Zeaman and House, 1963) and of high-risk children from disadvantaged backgrounds (Bereiter and Engelman, 1966; Blank and Solomon, 1969; Deutsch, 1964).

Currently, some of the best known and most often reported work in the field of attention in exceptional children was done by Zeaman and House (1963). They gave educationally mentally retarded and normal children simple 2-choice, color-form discrimination tasks and compared their rate of learning over trials. They interpreted their results as once the mentally retarded child learns which cues are relevant and is attentive to them, the child learns as well as the normal child. They posit that it is the ability to attend rather than the ability to learn which characterizes the disability. Zeaman and House have been criticized for using only tasks within the competency range of the retarded children and, thus, not addressing the issue that inattention may result from not knowing how to do the task. Nevertheless, they are technically correct in noting how important the role of attention is in learning.

It is increasingly evident that many of the problems encountered in educating the handicapped child have been attributed to attentional deficits. Recently, Dykman et al., (1971) have emphasized the importance of attentional deficits by proposing that problems in this area are the most significant determinant of learning disabilities. Keogh and Donlon (1972) report that the greater the seriousness of the learning disorder, the more extreme the problems of attention exhibited. Indeed, attentional deficits have begun to play almost a definitional role in some areas of exceptionality (Harris, 1976). If, indeed, the learning disabled child is separated from his "normal" peer in attentional patterns, then researchers are mandated to examine the concept of attention and attentional deficits more closely.

Attention--A Singular or Multi-Dimensional Process

Part of the confusion surrounding the relationship between attentional processes and learning failure may result from the fact that psychologists and educators are uncertain whether or not attention is a single, unitary characteristic or trait. And, if attention is a single trait, are the problems to be viewed as a unitary condition? It is reasonable that attention is made up of a number of different partially independent components, and that these components may have differential influences on learning (Keogh, et al, 1976). Kahneman (1973) addressed this dilemma:

> One of the classic dilemmas of psychology concerns the division of attention among concurrent streams of mental activity. Whether it is a unitary dimension or divisible was hotly debated by introspectionists in the 19th century, by experimentalists since 1950--and the question is still unanswered.
>
> Two common observations are pertinent to this question of the unity of attention, but the answers are contradictory. The first observation is that man performs several acts at once (e.g., he may drive a car and walk at the same time). The second is obtained by noting that when two stimuli are presented, often, only one is perceived--or responses to the stimulus are successive and not simultaneous. (p. 5)

Dykman et al., (1971) propose that attention consists of four interrelated functions: alertness, stimulus selection, focusing, and vigilance. Huelsman (1970) found that even though a WISC subtest, where attention is requisite, yielded characteristic performance patterns among groups of disabled readers, the pattern was not characteristic of a single child. He posited that some children with learning disabilities exhibit deficiencies in specific aspects of attention while others are deficient in other aspects (1976). Keogh (1976) argues that attention is not characterized by a single response mode, but rather it is evidenced in different ways relative to the task and functional demands.

Other proponents of a multifaceted view of attention, such as Posner and Boies (1971), suggest that attention encompasses at least three dimensions--alertness, selectivity, and processing capacity. Harris (1976) discusses the orienting response and stimulus selection division of attention. Keogh and Margolis (1976) separate the attention process into coming-to-attention, decision-making, and maintaining attention.

Neisser describes the preattention and focal attentional components of attention (1967). Preattention involves the control of immediate motor movements, coming-to-attention, and eyes-on-a-task. Focal attention involves the analysis and synthesis of the objects or tasks attended to. Neisser raises the question of which level of attention the learning disabled child has the problem (or the most problems) with--and hypothesizes that more of the problems are with focal attention. Neurologists would concur that an insult to the central nervous system would interrupt the higher processes before affecting the grosser, lower ones (Dykeman, et al., 1971). Neisser, too, argues that attention is not a singular phenomenon. He strongly suggests the viewing of a multi-faceted picture of attentional deficits and the building of networks of remediations to counter these deficits.

In contrast to these arguments supporting the view of attention as a multi-faceted phenomena, Douglas and her colleagues have found consistently significant correlations between measures of various aspects of attention (Campbell and Douglas, 1972). Douglas (1972) describes an underlying attentional dimension expressed in the ability to "stop, look, and listen." She has concentrated on what a child must do to attend and on what demands are made of him. She noted:

> We have been struck by the degree to which the measures that tap attention, impulse control, and the ability to approach tasks, seem to go together in these children. (p. 275)

Douglas notes that the child must remain selectively alert toward certain stimuli or certain kinds of stimuli, often over long periods of time. The child must maintain this alertness in the presence of other, highly compelling stimuli. In some instances, she asserts, the stimuli to which the child attends appear sequentially so that they can be processed one by one--and at other times the child must seek them out in a complex field.

In support of this interpretation of a more unitary phenomena of attention, the Montreal group (Douglas, et al., 1972) has provided evidence that attentional problems persist into adolescence, although the motoric signs of hyperactivity, so characteristic of younger learning disabled children, may diminish (Cohen, Weiss, and Minde, 1972). Additionally, it has been determined that the various aspects of the "stop, look, and listen" behavior are affected in common by certain medications (Sykes, Douglas, and Morgenstern, 1972; Sykes, Douglas, Weiss, Minde, 1971; Cohen, Douglas, and Morgenstern, 1971).

More directly related to the hypotheses of this study, Douglas and her colleagues examined a wide variety of tasks for the role and importance attention played in their accomplishment. Douglas says tasks differ in the degree to which the child's attention is demanded and the degree to which the child is left to his own devices. Sometimes there are aids or props which help direct and maintain a child's attention. Douglas and her colleagues have manipulated various aspects of these tasks in order to define the amount and kind of attention ability each task demands. She discusses the ability to attend to the task as a unitary cluster called "on-task behavior" (Douglas, 1974).

Whatever the theoretical position adopted, it is obvious that learning disabled children, like normal achieving children, attend to a variety of stimuli under a variety of conditions. It is the nature of the child's attentional deficit or the ineffectiveness of the child's attention in particular learning situations which appear to differentiate learning-disordered children from normal achieving children. Clinically, learning disabled children are described as distractible. Educationally, they are described as having short attention spans or as being unable to concentrate on a task. It seems quite clear that learning disabled children are indeed learning, although they may not be learning what the teachers and parents expect or at the rate that normal children do. Hence, they must be attending to some aspects of the learning tasks or attending some of the time. Research, to add to our knowledge about when and to what learning disabled children attend, is called for if, we are to provide appropriate and specific educational interventions for these children.

Attention To A Task and School Performance

Learning disabled children demonstrate difficulties attending to assigned tasks in the academic setting. They are described by their teachers as unable to concentrate on their work, easily distracted, and having short attention spans (Forman and McKinney, 1975). Although the etiological factors of the attention problem may vary with the child, and "attending behavior" may be multi-faceted or unitary, as argued by differing psychological researchers, the observed results are the same (Dykman, Wall, Suzuki, Peters, and Ackerman, 1970). The learning disabled child has problems maintaining attention to the assigned task.

Educators have accepted implicitly that maintaining attention to a task is crucial to academic success. Until this decade, however, there was only limited experimental evidence to support this belief (Keogh and Margolis, 1976). Most of the work on the task-related attention of children with learning disabilities came from experimental studies on vigilance--i.e., maintaining attention usually to a visual stimulus (Hallahan, Kaufman, and Ball, 1974; Atkinson and Seunath, 1973; Luria, 1961; Roswold, Mirky, Sarason, Bransome, and

Beck, 1956; Campanelli, 1970; Grais, 1971; Anderson, Halcomb, and Doyle, 1973; Trabasso and Bower, 1968; Kirchner, 1976; and Doyle, Anderson, and Halcomb, 1976). The general conclusions drawn from this body of experimental research were that learning disabled children were less attentive (vigilant) to the task than their normal peers and they made many more performance errors. Additionally, they concluded that the less attentive the child was to the task, the more errors the child made--and the more active the child was, the more errors he or she made. Moreover, when distractors were added to the experimental situation, the learning disabled populations were more susceptible to the distractions and, consequently, exhibited more off-task behavior (Atkinson and Seunath, 1973; Doyle et al., 1976; Caldwell, 1976; Luria, 1959). In the implications drawn by the authors of each of these studies, the ability to maintain attention to a task was concluded to be important for school performance.

In an effort to define more clearly the relationship between attention to a task and academic achievement or school performance, Margolis (1972) observed a group of 135 third grade children in regular classes. Her independent measures included both school task performance and performance on vigilance tasks experimentally administered. Her dependent measure was amount of on-task behavior. The findings substantiated the relationship between attention to a task and achievement on that task. Kirchner and Knopf (1974) compared high acieving second-graders with a matched group of low achieving children on continuous performance and vigilance tasks and found superior performance for the high achievers and poor performance for the low achievers. Samuels (1974) examined the relationship of reading and attention to task, which was observed and coded for three classes of first graders across all tasks, and found that attention measures distinguished retarded from adequate readers.

McKinney, Mason, Perkerson, and Clifford (1975) assessed the predictive value of children's behavior patterns early in a school year for their achievement at the end of the year. It was found that the child who was attentive and task-oriented was much more likely to succeed than the child who was inattentive and distractible. Cobb (1972) and Spivack, Swift, and Prewitt (1971) demonstrated high positive correlations between attending and reading achievement and a high negative correlation between "looking around" and reading achievement.

Lahaderne (1968) observed four 6th grade classes to determine if attention to the assigned task was related to attitudes toward school and/or academic achievement. She found no relationship between attitudes and attention, but she reported high positive correlations between attention and achievement scores. In a series of studies on reading research spanning a ten-year period, Staats (1968) and Staats, Brewer, and Gross (1970) observed the on-task behavior of preschoolers and first graders learning to read. They found that children who learned the alphabet first and with fewer trials had more on-task behavior. They concluded that attention was the critical variable in the early stages of learning to read. Friedrichs (1971) analyzed learning activities at the preschool level using eight categories such as problem-solving, category sorting, oddity learning, and observational learning. He found that the child behavior of attention correlated most highly with performance on 5 of the 8 learning categories.

Other researchers have concurred that attention to a task, task engagement, on-task behavior, or maintained attention is associated significantly with school success (Fornes and Esveldt, 1975; Bryan, 1974; Bell and Davidson, 1975; Gilmore, 1968; Filby, Marliave, and Fisher, 1977). The relationship of attention and school success is even more dramatically observed in groups of learning disabled children. It is reported that learning disabled children spend significantly less time engaged in task-oriented and more time in behavior unrelated to the task, regardless of content area (Douglas, 1974; Bryan and Wheeler, 1972). Whether the populations of subjects were normal or atypical, both sets of studies conclude that attentional disorders account for a substantial portion of academic failure.

Two noteworthy sources do not concur with the bulk of the literature supporting the correlation of attention with academic performance. The investigators of the large, on-going PRIME study reported that with their observations of mainstreamed and non-mainstreamed handicapped children, they could not show that attention was directly related to achievement because attention seemed highly influenced by socio-economic factors in their data (Egard, 1977). Harris (1976) concludes, after examining the literature on attention training, that there is little evidence that attention training produces changes in learning disabled children or improves their academic abilities. He avers that attention deficits are not the major determinant of school failure.

Despite the lack of concurrence of these final two sources on the relationship of attention to school performance, the diverse but extensive evidence reviewed in this paper provides sound basis for concluding that problems of attention contribute significantly to the learning failure of many children an, perhaps more dramatically, the learning failure of learning disabled and other handicapped children.

Etiology of Attentional Disorders

Four sets of hypotheses appear consistently in the literature which offer tenable explanations of etiological factors causing attention problems in children, primarily in learning disabled children. The hypotheses are in no sense exhaustive or mutually exclusive, though they have different theoretical and remedial implications (Keogh, 1971). The first hypothesis represents the medical neurological syndrome explanation--inattentiveness or distractibility is caused by neurological impairment. Hypothesis two suggests that increased motor activity, as observed in hyperactive children, disrupts attention to a task. The third common hypothesis states that impulsive decision-making on the part of the learning disabled child results in impaired attention. Alternatively, a fourth area of etiological factors--a potpourri of alternative explanations--is discussed.

Neurological Impairment

As pointed out by Hallahan and Cruickshank (1973), the field of learning disabilities sprang from earlier work with brain-damaged children, and many of the behaviors attributed to the brain-damage are characteristic of those children who are presently classified as learning disabled. Medically oriented investigators are convinced of the organic etiology of attentional problems.

Schulman, Kasper, and Throne (1965) conducted extensive investigations comparing brain-injured children and children who were considered familial mentally retarded. Using cluster analyses on behavioral and diagnostic measures, they concluded that inattentiveness and distractibility was supported almost unequivocally as a correlate of neurological impairment. Gallagher (1957) found children who were classified as brain-injured, performed tasks equally with familial mentally retarded children. However, the brain-injured children were more inattentive, more distractible, and slower.

There can be little doubt that a significant number of children with attention problems may have neurological dysfunction (Clements and Peters, 1962; Cruickshank, 1957; Cruickshank, Bentzen, Ratzeburg, and Tannhauser, 1961; Kaspar, Millichap, Backus, Child and Schulman, 1971). However, symptom patterns are variable, and the relationships of symptomatology to attention is unclear (Anderson, 1963; Ayers, 1964; Keogh, 1971).

Strauss and Werner (1942) and Strauss and Lehtinen (1947), who worked with neurologically impaired children and who were committed to the medical and neurological etiology school, were the first to suggest that these children were "unable to respond selectively to the appropriate elements of a field." They attributed these findings to the inability of a child to refrain from responding to nonessential stimuli or "forced responsiveness" as it was called by these researchers. This view of exaggerated responsiveness to stimuli paved the way for the second hypothesis about attentional problems--increased motor activity.

Increased Motor Activity

The second hypothesis concerning attentional disorders of learning disabled children assumes that the child may be neurologically intact, but the nature and extent of his motor activity disrupts his attention to a task. Werry (1969), Sprague (1969), Luria (1961) and Birch (1964) noted that heightened and inappropriate motor activity was a powerful interference to the normal span of a child's attention. Cruickshank and Paul (1971) described children who reacted to irrelevant, extraneous stimuli as unable to focus selectively on a task. Early longitudinal work by Schaefer and Bayley (1963) reported that young children with increased motor activity were found later in school "to be inattentive and lacking in concentration." Walker and Hops (1973) and Cobb and Hops (1973), in their research on academic survival skills, have shown heightened motor activity to be the corresponding inappropriate behavior paired with the appropriate survival skill of attentiveness to a task.

Because most of the children observed in this author's study exhibited noticeably heightened motor activity, it is appropriate here to review briefly the research linking increased activity levels to academic performance. Freiberg and Douglas (1969) found that learning disabled children with increased motor activity were as successful as normal children on concept attainment tasks, but only under certain reinforcement conditions which slowed down their activity levels. They concluded that these children can learn--just as Zeaman and House (1963) had concluded earlier with mentally retarded children--if they are attentive to the information.

Maccoby, Dowley, Hagen, and Degerman (1965) aver that successful and unsuccessful preschoolers do not necessarily differ in amount of total body movement, but that the successful child regulates his activity at important times during a learning task whereas unsuccessful children's movements interfere constantly with attention to the task. Carrier, Malpass and Orton (1961) have done research with an older population which concurs with the Maccoby, et al., findings.

Keogh (1971), who supports the increased motor activity hypothesis, has summarized the research findings supporting this position. She argues that a decrease in motor activity would increase attention to the task which would allow more accurate intake of information, and thereby increase the probability of successful learning.

Impulsive Conceptual Style

The third hypothesis, proposed to explain the etiology of attentional disorders in learning disabled children, is that these children have speeded-up or impulsive decision-making processes. That is, the learning disabled child makes decisions too rapidly. Impulsivity refers to the conceptual or learning style dimensions of "impulsivity-reflectivity" defined by Kagan, Rosman, Day, Albert, and Phillips (1964). These dimensions describe individual differences in tendency toward fast or slow decision time. The impulsive child characteristically makes rapid decisions and many errors. Kagan's framework, though currently disputed methodologically as well as conceptually (McKinney, 1978; Haskins, 1978) provides the framework used in this hypothesis to explain certain behavior patterns of learning disabled children.

Kagan et al., (1964) have found that children scoring high on impulsivity on the Matching Familiar Figures Test, a measure of conceptual tempo, were less attentive, more distractible, more physically active during administration, and had poorer performances. McKinney (1973; 1975) reported that children classified as impulsive performed consistently poorer on problem-solving tasks. Douglas (1974) and Campbell, Douglas, and Morgenstern (1971) found that attention was related to impulse control. They found that the Matching Familiar Figures Test significantly differentiated between learning disabled and normal children, with the learning disabled children receiving significantly higher impulsivity scores. This finding has been replicated by Cohen, Weiss, and Minde (1972).

Kagan has hypothesized that cognitive impulsivity may be part of a larger syndrome which includes heightened motor activity and inattention. Ward's findings with kindergarten children, which related performance on an adapted version of the Matching Familiar Figures Test with attention and impulsivity, are compatible with Kagan's interpretation (1968).

Douglas (1971) speculates that impulsivity is the cause of attentional disorders. Methods used by Douglas, as well as other researchers, to observe the scanning strategies of children presented a task, have revealed that reflective children engage in more systematic searching for the relevant cues in the stimulus materials (Drake, 1970; Siegelman, 1969). Drake found that reflective children directed more of their regard and looked longer and at larger portions of the task materials. Such a search strategy, states Douglas, demands sustained, well-organized attention to the task.

Further support for the relationship of impulsivity and attentional disorders comes from the work of Meichenbaum (1975), Meichenbaum and Goodman (1969), and Palkes (1968). These investigators have trained learning disabled boys to "slow down," "pay attention to the task," "look at the problem--all of it," and "stay put." By the use of self-directed verbal commands, the children train themselves to be attentive, reflective problem-solvers, according to the hypothesis. Meichenbaum (1975) reported that training resulted in an increase in both attention to the task and task performance.

Moreover, in support of this hypothesis, Freiburgs and Douglas (1969) found that under a 100% reinforcement schedule--i.e., a reinforcement for every child response--impulsivity decreased and attention to the task resulted. Keogh (1971) interpreted the Freiburgs and Douglas finding in view of Meichenbaum's work--a child acts on the first relatively reasonable inference failing to consider alternative solutions. The 100% reinforcement schedule promotes attention to the task which, in turn, decreases the number of possible alternative solutions, thereby decreasing the "cognitive uncertainity" which Meichenbaum suggests causes the increased motor activity of movement, touching and holding behavior.

Alternative Explanations

Individual differences in attention to a task are complex and varied. We have reviewed earlier some of the suspected etiological factors of attentional deficits. Common sense implicates certain within-child differences such as motivation. A demonstration of an educationally inattentive child's ability to sit quietly in front of a television set for a prolonged period of time has been observed informally by parents and educators and formally by researchers (Rust, 1971a; 1971b). Other investigators (Gale and Lynn, 1972; Herring and Koch, 1930; Kassinove and Summers, 1968; Routh, Schroeder, and O'Tuama, 1974) have reported changes in attention with age or developmental level. It is possible, too, that ability or willingness to maintain attention to a vigilance test or a dull, repetitive math workbook may be evidence of willingness to conform. Keogh warns that the child who makes errors of omission on the experimental continuous or vigilance performance tests or who does not finish his arithmetic may be unwilling, not unable, to accomplish the work successfully (1976).

A final hypothesis explaining differences in attention to a task, is the relationship of certain properties of the tasks and learning settings to a child's attention. Whether it is the "holding power" of certain learning activities (Rosenthal, 1973) the signal systems of lessons (Kounin and Gump, 1974; Kounin and Doyle, 1975) or the more experimental effects of stimuli which demand the attention of a child (Moyer and Gilmer, 1954; 1955), the learning environment is implicated by this hypothesis as the primary determinant of attention of the children who occupy that environment. This final hypothesis will be expanded in the following chapter.

In summary, the focus of the research reviewed in Chapter One is on the scope and the etiology of attentional disorders in learning disabled children. The learning disabled child is viewed as having a deficit in attention whether due to neurological impairment, increased motor activity, an impulsive conceptual style, or a misfit of the child and his learning environment. Chapter Two will examine the literature related to dimensions of the learning environment and their relationship to attention.

CHAPTER TWO

DIMENSIONS OF THE LEARNING ENVIRONMENT: Their relationship to the attention of the learning disabled child

Environmental psychologists and educational researchers probing the impact of the classroom environments upon the attention and performance of children have been most liberal in selecting environmental variables to observe and record. These environmental variables have included "climates" of the classroom (e.g., vigor, security, warmth, work-mindedness, sociality, cliqueness, formality); properties of the child occupants (e.g., sex, race, IQ, socio-economic status, self-concept, level of disability, age); teacher talk or social behavior (e.g., praise, amount of talk, humor, friendliness); architectural variables (e.g., classroom size, use of space, noise levels, light, furniture patterns); programming variables (e.g., time in class, time-of-day, day-of-week, teacher-child ratio, curriculum type); and even something called "pupil glee."

Gump (1975), Kounin (1977) and Scott (1977) have all encouraged a more discriminating selection of environmental variables in favor of limiting the meaning of environment as applied to research on the ecology of a learning environment. The environmental unit they have used in their work comes from the pioneering research of Barker (1968) and is referred to as the *behavior setting*. The behavior setting is defined as a learning environment which includes the props of the task, the standing pattern of behavior or routine of the task, communications surrounding the task, and a set of temporal and spatial boundaries. Variables within this more limited view of the learning environment include such measures as duration of the task, occupancy time of the child, complexity of the task, group size, group process, teacher communications, pacing of the task, degree of pupil choice, lesson signal systems, degree of structure of the task, who structures the task, and who initiates the task (Scott, 1977).

The dimensions of the learning environment that this review of literature will address fall into the behavior setting framework and are related to the attention of the children participating in that environment. They are *dimensions of the task or lesson*, *dimensions of teacher communication*, and *dimensions of the setting*.

Dimensions of the Task or Lesson

Researchers and theoreticians in psychology and education have emphasized the importance of examining the aspects of the learning task. Clements and Peters (1962) claim that task structure and complexity are major variables affecting the attention of learning disabled children. Ross (1976) examined the variables related to reading disorders and urged that careful attention be paid to the nature of the task and the teaching materials presented to the learning disabled reader, so as to make it easier for the child to attend to critical features and maintain selective attention. Tasks, asserts Keogh (1976), should be examined and restructured to match the particular needs of the child with learning problems. Concurring with these researchers, Siegel (1975) resolves:

> It may well be that to create an effective learning environment we must forget the child and concentrate on the task. We can not, of course really forget the child--it is more a question of emphasis. If we get hung up on diagnosing the child's disability, we may never get around to consideration of the learning environment and its sequential components. (p. 3)

Research literature was surveyed for five areas of task-related variables which might have bearing on the attention of learning disabled children: Pace and Intensity, Structure, Cues, Complexity, and Signal Systems.

Pace and Intensity

Cohen (1968) makes a point that the learning disabled child has a unique combination of "negative psychosocial, psychophysical, and psycholinguistic" characteristics that require a high intensity learning environment. A high intensity learning situation, according to Cohen, refers to a "systematic management of task pace, contingencies, content level, and rate or frequency of child responses." He argues that most classroom instruction is "exposure," and that even most special or remedial services are sufficiently low in intensity to be classified as "exposure." Low intensity instruction or instruction which lacks systematic management of pace and contingencies results in not learning, Cohen declares. Even a slight increase in pace and intensity of instruction, he asserts, eliminates a measureable amount of inattentiveness and distractibility.

Intensified instruction, according to the developers of DISTAR, a reading program for low achieving readers, is a system where the child responds to prescribed stimuli in about 85-90% of the instructional time. The pace is fast and immediate feedback is provided to the child's response. Carnine (1976), a creator of DISTAR, examining the effects of presentation rates on off-task behavior and correctness of performance using DISTAR methodology, found that a faster instructional pace decreased off-task behavior and enhanced answering correctly.

Grobe and Pettibone (1975) investigated the effects of varying instructional pace (fast, moderate, and slow) on six dimensions of student behavior, including attention and disruptiveness. They found that there was a relationship between pace and attention. Fast pace increased a child's individual attention and decreased nondisruptive inattention. No measureable effect was recorded for either moderate or slow pacing.

Keogh and Margolis (1976), referring to the conceptual tempo dimension of impulsivity discussed earlier, suggest that careful selection of the appropriate pacing (rate of presentation) of the task could make use of the learning disabled child's speeded up response style. This careful pacing could shape the accuracy of his responding--which, some argue, is the more critical dimension (McKinney, 1978). Meichenbaum (1975) recommended the manipulation of instructional pace to find the optimal speed which maximizes attention and accuracy in the learning disabled child.

Conflicting Research findings concerning pacing have been reported by Douglas (1974), Cohen and Douglas

(1972), and Luria (1959; 1961). Douglas argues that research on instructional pacing, including her own findings, has produced contradictory results with learning disabled populations. Luria found that when task presentation rates were increased, either the learning disabled child did not respond or responded "impulsively with uncontrolled responses."

Cronbach and Snow (1977) looked at the effects of instructional pacing and found the results confused because pacing, they assert, affects the difficulty level of the task and the teacher reinforcement schedule. They did, however, examine the effects of self-pacing on children's task engagement and performance. They found that children who paced themselves fast were more attentive and performed better on tasks that were paced fast by the teacher than did children who paced themselves slow. They interpreted these findings, within their aptitude-treatment-interaction framework (i.e., the interaction of the child with the learning environment) as meaning that optimal results come when the instructional pace is matched to the student. Douglas (1974) concurs with Cronbach and Snow and reports that learning disabled children achieved more correct responses on several experimental tasks when allowed to self-pace than when they were externally paced.

Task Structure

A basic tenet in special education services for children with learning problems has been that it is possible to compensate for lapses in attention by providing learning tasks which are highly structured. Systematic sequential management of prescribed stimuli, Cohen argues (1968), is what remedial reading instruction should involve. Cronbach and Snow (1977), contradicting somewhat their research on instructional-pacing, found that low-achieving children were more engaged in formal lessons which were structured, possessed an authority figure, and were teacher-directed.

Meichenbaum (1975) asserts that a highly structured learning setting provides children with the "cognitive supports" necessary to maintain attention and promote performance--e.g., task aides, cueing, feedback, and memory supports. Keogh, Welles, and Weiss (1972) propose that a lack of structure in the instructional setting increases the ambiguity of the task demands which causes the child to do more inefficient information-seeking like glancing around. They advocate specifying a clearly defined task, with clearly defined starting and stopping points, and a well defined outcome to optimize attention to the task of learning disabled children.

In an experimental attempt to train children to do a task independently, Liebert, Hanratty and Hill (1969) examined the effects of several training methods varying in levels of structure. They found that the methods high in structure were superior for training a child to work independently. Because an increased ability to work alone is an overt objective in all special education services, the Liebert, et al., finding, though not specifically related to attention, seems appropriate.

Somewhat related to structure is length of the task or formal lesson. Research using children's television programs such as "The Electric Company" has shown that duration of a task is a powerful determinant of attention (O'Bryan, 1975). Douglas (1974) reports that her data suggest that learning disabled children are more attentive if the task to be learned is broken into small parts and the child is oriented toward each part as it is introduced. Keogh and Margolis (1976) agree with Douglas' finding and advocate tasks of short duration.

Cues

The teaching task, posits Allington (1975) is one of focusing a child's attention appropriately. For the learning disabled child with attentional deficits, the importance of this focusing becomes paramount.

Cueing the child to distinguish features of each stimulus is both necessary in the maintaining of sufficient attention to the task and in the development of appropriate responses, continues Allington. Research on cueing includes studies on visual cues of the task props, verbal and nonverbal cues given by the teacher, and cues in combinations.

Knafle (1973) has demonstrated that attending behavior of children can be influenced by color cues used in the task props. Color cues used to highlight phonogram patterns appeared to aid in the detection of word structures. In a further study, Knafle (1974) demonstrated that color cueing of letters in certain positions in words aided children in word identification. Trabasso and Bower (1968) have shown that increasing the size, underscoring, and using color cues have increases selective attention. Additionally, they found that the overuse of cues rendered the salience of the critical cues useless to the child. Allington (1974) employed visual cues similar to Knafle's and Trabasso and Bower's and found that, predictably, some low achieving children continued to err after such exposure. He insists that additional instructional assistance is needed for the child with learning problems to maintain attention to the task and identify the salient features of the task.

Other successful techniques for cueing include teacher verbal and nonverbal cues such as those employed in instructional programs like Walker's at the University of Oregon (Walker, Fiegenbaum, and Hops, 1971; Cobb and Hops, 1972) and those described by Englemann (1969). Such commands as "say it slow--say it fast" and the snapping of the fingers when the response is demanded were employed.

Though it is agreed that cues lead children to attend to distinctive elements of a learning task, Trabasso and Bower (1968) found that when the child was not fully informed of the meaning of the cues, they not only had no effect, they may have even distracted the child. Engelmann, addressing this point, found it necessary to program in a "cue-training" session into each new learning activity with a child.

Stevenson (1975) and McCarthy (1976) concur with Trabasso and Bowers and note cases where young normal children have been trained to attend to cues, but only after they have been pointed out in advance. They interpret this evidence as support for developmental lag in attention skills of learning disabled children.

Additional support is offered for the relationship between the use of cues and attentional behavior by Meacham and Nicolai (1975) and O'Bryan (1975). Meacham and Nicolai examined the effects of pointing, verbal cues, and looking by the experimenter on the attention of preschool children, and found that the children attended to pointing cues more than to looking or verbal cues. O'Bryan observed children's attention to "The Electric Company" scenarios and analyzed the scenarios for cues which might affect "looking behavior". He concluded that movement by the presenter was the most powerful determinant of attention to the scenario.

Complexity

Another property of tasks which seems to be related to attention is task complexity. Estes (1970) points out that one of the most effective ways to assure that a child attends to and completes a task is to devise tasks which have been carefully programmed from simple to difficult. Cantrell (1974) investigated the relationship of the difficulty level of a task to attention and disruption behaviors in high, normal, and low-achieving sixth graders. She found the low-achieving group was least attentive and most disruptive during the most difficult lessons--and most attentive and least disruptive in the least difficult lessons. The converse was true of the high-achieving group.

The finding that task complexity is related to attention is further supported by Snelbecker (1972), Berliner (1977), and Keogh, Welles and Weiss (1972). Snelbecker looked at attention to a task as a function of both task difficulty and feedback schedules and found that task difficulty was considerably more predictive of attention behavior. Keogh, et al., found that when preschoolers were confronted with new and difficult tasks they glanced away more frequently and were generally less attentive than with easier, familiar tasks. Moreover, Fisher (1974) experimented with allowing one group of children to choose the complexity level of a task and compared this group's task-engagement with a second group which had an age-normed task assigned. The complexity-choice group exhibited a significantly higher precentage of task engagement than the complexity-assigned group.

Signal Systems

One of the principle ways tasks differ is in the pattern of their signal systems. These signal systems are the external provisions of a task or lesson which signal standard behavior patterns or actions (Kounin, 1977). Simply stated, they are the rules of the game which occur over and over. Most of the research on signal systems has been based on the principles of ecological psychology supported by Barker (1965), Gump (1976) and Kounin (1977). Researchers have shown that various signal systems produce differing levels of on-task behavior in children.

Kounin and Gump (1974) observed formal lessons taught in kindergarten over several years and discovered that certain lessons produced predictable patterns in the children participating. They found that when signals come from the effects of a child's own behavior on the materials (e.g., cutting out patterns with scissors or drawing) the child demonstrated high task engagement. When signals were sequenced and from a single, continuously emitting source (e.g., demonstration) the child was moderately on task. During a recitation session in which multiple signal sources were apparent, because other children as well as the teacher were signal sources (e.g., group drill with number facts), the child exhibited moderate to low engagement. And finally, multiple, shifting signals primarily from child sources (e.g., role-playing, general talking) produced low on-task behavior. These data strongly suggest that signal systems within a lesson or task are clearly related to attention.

Kounin and Gump concluded that the more continuous the external provisions or signal systems of a lesson, the greater the task involvement of the participating children. Moreover, they found that certain types of lessons are more likely to produce a continuity or absence of lags than others.

Further support of the relationship of signal systems to attention behavior comes from Davenport's (1976) analysis of deviancy in the classroom. Davenport examined a group of preschool children for each incident of deviant behavior occuring within a formal lesson. He classified the lesson formats on a variety of properties, including when the lesson was "off" or in transition. One finding, he observed, was that when the lessons were in transition, deviant behaviors which occurred were of longer duration and more likely to spread to other children than when the signal systems were operative. Additionally, he found that deviant behavior was least prevalent in lessons exhibiting similar properties to Kounin and Gump's individual construction format. Conversely, he found deviant behavior most prevalent in role-play and group interaction (lesson types similar to the multiple, shifting type discussed by Kounin and Gump).

Another study examining the relationship of signal systems to task engagement was done by Kounin and Doyle (1975), who attempted to measure the degree of continuity within any one type of task. They examined, for example, teacher-reading lessons and compared those lessons with high task involvement with those exhibiting low task involvement when taught by the same teacher. They found that off-task behavior occurred when the internal format changed from a continuous teacher-emitter of signals to the format of potentially faltering child-emitters--which occurred when, for example, a multiple child recitation format began within the teacher-reading lesson. When they compared the high involvement lessons with the low involvement lessons, they found that the low involvement lessons slipped into a signal system of multiple child emitters more often and for a greater amount of time.

Other investigators, having the same theoretical orientation as Kounin (1977) and Gump (1976), have examined the "holding power" of tasks or learning settings. Moyer and Gilmer (1954) began a discussion over two decades ago which proposed that the "holding power" of an activity (i.e., the setting's capacity to sustain attention) was to the task as "attention span" was to the child. Both terms were describing duration of task involvement.

Rosenthal (1973), using this "holding power" orientation, examined the consistency of individual preschool children's attention-spans in 13 different activity settings. Each child's length of involvement in any one activity setting was compared with the length of involvement in each of all other settings in which the child was involved. She found that art, sand, and book activity settings had the highest holding-power and that classroom displays had the lowest. Setting differences in holding-power were equally applicable to all sex, race, and age groups which led her to conclude that task involvement is influenced more by the learning setting and task properties than by within child characteristics such as sex, race, or age. She interpreted these findings to mean that a child's involvement in an activity setting is more reasonably attributable to the task's holding power than to the child's attention-span.

Regarding the Rosenthal study, it is of interest to note the properties of both the high involvement and low involvement lesson settings. Art, sand and books contain clear products or signs related to the child's actions. These areas could be said to have consistent "standing behavior patterns"--to use Kounin's description of an individual construction lesson, where the signals come from the child's own behavior on the materials. Predictably these activities would have high task involvement associated with them, as was shown by Rosenthal. Displays, conversely, exhibit no clear product or sign of the child's action upon them, and the standing behavior pattern is somewhat unclear. Rosenthal found displays to have low task involvement.

Doyle (1975) did a study similar to Rosenthal's in which his dependent measures were both task involvement and sociality (social and anti-social interactions). He found that the settings which elicited high task-involvement had low degrees of social interaction (e.g., art) and settings which had low task-involvement had high sociality (e.g., role-playing).

In summary, literature on signal systems of tasks or lessons has shown them to influence (whether by the use of their standing behavior patterns, their continuity and absence of lags, or their "holding power") the degree of task engagement of children participating in these tasks.

Dimensions of Teacher Communication

Because types and execution of lessons or tasks are clearly related to dimensions of teacher communication, any analysis of the learning environment would be incomplete if it did not look at this important manifestation of teacher behavior. Hess and Takanishi (1974), after a series of studies on techniques used by teachers to arouse and maintain attention in the classroom, posit that teacher communication accounts for most of the variance in task engagement.

Critical to the concern with learning disabled children, Cronbach and Snow (1977) assert that differences in teacher communication styles effect low achievers even more than normal achievers. A dearth of research exists which taxonomically details aspects of the global "teacher communication" variable, though investigators into the environment of the classroom continue to declare that this variable significantly affects attention.

For the purposes of this study, literature in the areas of the effects on attention of Instructional Communication, Reinforcement Communication, and Quantity of Teacher Communication will be examined. No literature was found dealing with the effects of managerial, informal or other types of teacher communication on attention.

Instructional Communication

Most of the research examining the relationship of instructional communication and attention comes out of the work with Walker and Engelmann, both at the University of Oregon. Related to his work on cueing, Englemann

(1969) found that the optimal task engagement, for children in a remedial reading program, was obtained when teachers communicated a demand for an instructional response from the child 85-90% of a 20 minute lesson period. These communications included both questions and instructional commands.

Walker (1968) examined the effects of several frequency levels of instructional communications on attention to a task and achievement and found the higher frequencies of instructional communication facilitated both attention and achievement. A further study by Wood (1975) supported the Walker finding.

Wright and Nuthall (1970), in their comprehensive study of teacher talk examined instructional communication for its taxonomic categories and delineated solicitation communications (i.e., questioning) from structuring communications. They found the solicitation type of instructional communication to be related to increased achievement while their findings on structuring communication was inconclusive. Though they did not look specifically at attention behavior, they suggest that the intervening variable in the increase in achievement might have been an increase in task involvement under the high solicitation mode.

Berliner, who has done extensive research in the area of task engagement in the regular classroom (1977), has concluded that the most effective classrooms (measured by mean on-task behavior for all students) had teachers who systematically used what Berliner called "academic press" methods, defined as a high frequency of direct instructional communications.

Reinforcement Communication

By far the most research in the areas of teacher communication and their effect on attention has been done in the area of reinforcement communication, especially on "teacher praise." Whether this plethora of research is due to the fact that verbal reinforcement is the component of teacher communication most clearly related to attention (Geller, et al., 1975) or whether this is because positive feedback is a reasonably stable teacher presentation characteristic (Shavelson and Dempsey-Atwood, 1976) is uncertain. However, many researchers tend to agree that teacher praise of a child's response on a task facilitates that child's attention to that task (Cossairt, Hall and Hopkins, 1973; Kuyper, Becker, and O'Leary, 1968; Walker and Hops, 1975; Cobb and Hops, 1972; Patterson, 1965; Taffel, O'Leary and Armel, 1974; Kazdin and Klock, 1973).

With learning disabled populations, investigators have confirmed the relationship of reinforcement communication and attention (Hall and Broden, 1967) and have examined the effects of various verbal reinforcement schedules. Freibergs and Douglas (1969) found that hyperactive, learning disabled children were as attentive as normal children under a 100% verbal reinforcement schedule, but evidenced typically heightened motor activity patterns under a 50% schedule. Findings supporting the higher reinforcement schedules were also reported by Keogh (1976), Clements and Peters (1962), Palkes, Stewart, and Kahana (1968), Patterson (1965) and Wagner and Guyer (1971).

Qualifying research in this area of reinforcement communication with learning disabled children was reported by Douglas (1974) who found that positive reinforcement promoted attention in both learning disabled and normal populations, but sensitivity to specific demands of the tasks occurred only in normal children. Douglas warns that verbal reinforcement facilitates attention to a task when it is associated with specific contigencies in a learning situation, but promotes irrelevant motor responses in learning disabled children when it is not specific. There is some evidence that nonspecific reinforcement statements may actually inhibit attention to the task in these special populations, she points out.

With underachieving children, experimenters have trained for increased attention and academic performance (Chadwick and Day, 1971 ; Cobb and Hops, 1972 ; Walker and Hops, 1975). Walker and Hops (1975) used three training conditions with three experimental and one control group to facilitate attention and achievement. These three training methods included verbal reinforcement of attention to a task (e.g., "Very good, Mary, you are attending to your book."), verbal reinforcement of specific academic responses (e.g., "3 x 8 = 24, right!"), and both concurrently. They found no significant differences among the three conditions of verbal reinforcement, but all produced more gains than the no verbal reinforcement control. This study, added to previous work by Walker and Hops, led them to conclude that reinforcement communication does increase both attention and achievement and these outcomes are optimized when the verbal reinforcement is "highly descriptive and very specific."

Concurring research results supporting the effects of verbal reinforcement on the attention behavior of mentally retarded children, were reported by Hill (1976), Kazdin (1973), and Geller, et al., (1975). Hill reported that for maintaining attention teacher praise of on-task behavior was superior to the rewarding of a correct task response. Kazdin, noting the effect of reinforcement communication to one child on the behavior of his peers, found an increase in the on-task behavior of non-targeted children when the teacher praised the target child.

In summary, the bulk of this research evidence concludes that teacher reinforcement communication is a vital factor related to the task engagement of the child.

Quantity of Teacher Communication

Most of the research related to the effects of the quantity of teacher communication has been concerned with the inequalities of teacher-child communication between certain populations of children. Studies by Jackson and Lahaderne (1967), Blakey (1971), Rothbart, Dalfen, and Barrett (1971), Good (1970), Rubovits and Maehr (1971), Kester and Letchworth (1972), Brophy and Good (1970), Given (1974), and Mendoza, Good, and Brody (1971), have all demonstrated that teachers communicate more with high-achieving children than with low achievers. A study by Tausch, Bartel, Fittkau, and Hubsch (1968) found that teachers communicated six times more often with the high-achieving top third of their classes when compared to the low-achieving bottom third.

Though the non-categorical amount of teacher communication has not been looked at as a variable related to task engagement, it has been examined in relation to achievement. Firestone and Brody found that the total number of teacher-child interactions were predictive of achievement (1975). In a longitudinal study of the interactions in self-contained special classes for mentally retarded children, Semmel, Sitko, and Kreider (1973) found that the amount of teacher communication was related to the increase in communication skills of this special population.

Evidence supporting the relationship of quantity of teacher communication to achievement or attention raises the puzzling issue of direction of effects. While Firestone and Brody conclude that knowing the quantity of teacher communication to a child provides significant information on that child's performance, the explanation is unclear. Does a child's attentiveness cause the teacher to interact with him more often? Or does a child's inattentiveness lead to low rates of teacher communication as well as poor academic performance? Research evidence is not readily available on which to base answers to these questions.

Dimensions of the Setting

The final area of the learning environment which is related to the attention of learning disabled children is the setting. In actuality, setting here is a potpourri of classroom characteristics directly related to the child's behavior (as defined by Gump, 1975; Kounin, 1977; and Scott, 1977 and discussed earlier) but not covered by task properties or teacher communication. According to Scott (1977), this area of setting contains variables such as group size, teacher-child ratio, occupancy time of the child, teacher role, group interaction process, degree of pupil choice of activity or work group, and ownership of the task. Research literature examining the relationship of these aspects of the learning environment to attention was available for teacher-child ratio and group size.

Teacher-Child Ratio and Group Size

Hess (1973a) examined the relationship of the amount of task engagement of normal third and fourth graders to the class size and found lower levels of engagement for larger classes. Additionally, Hess, et al., (1973) looked at the amount of engagement within the smaller instructional settings and found the amount also dependent upon group size--the larger these instructional groups, the less task engagement.

Two studies have examined the effect of group size used in learning disabilities resource classrooms on academic performance (Moody, Bausell and Jenkins, 1973; Jenkins, Mayhall, and Jenkins, 1974). These studies have compared various teacher-child ratios commonly used in resource classrooms (1:1, 1:2, 1:3, and 1:5). Moody, Bausell, and Jenkins (1973) found that the greatest difference in achievement outcome was noted between the ratio groups of 1:1 and 1:2. Though differences were noted between other ratio groups, they were not significant. This finding was interpreted by the investigators to mean that the greatest loss in performance occurs as the instructional ratio changes from a 1:1 tutorial type setting to a small group (≥ 1:2) setting.

Jenkins, Mayhall, and Jenkins (1974) compared achievement outcome for two matched groups--one in a 1:1 program setting and the other in a 1:5 program setting--and found the 1:1 program setting produced the superior results. Contrarily, preliminary data from DISTAR research (Steinboch, 1978), which address the question of the relationship of group size to attention behavior of special populations, suggest that the effects of group size (comparing ratios from 1:1 to 1:5) are not critical when the DISTAR instructional methods are employed.

The briefness of this section on dimensions of the setting is, in the opinion of the author, no indication of its relation to the task engagement of learning disabled children or its overall importance to research into the ecology of the school or the special classroom. Research on setting variables within the limited ecology of the behavior setting--as defined by Paul Gump, Jacob Kounin, and Myrtle Scott--is however, at a minimum.

Conclusions From The Research Literature

Investigations into the nature and characteristics of learning disabilities have revealed a plethora of attentional problems which permeate and impair the functioning of the learning disabled child. Research evidence provides a sound basis for concluding that measures of attention are predictive of a child's performance in school and that problems of attention are important in the learning failure of many children--most dramatically learning disabled children.

Whereas the effects of attentional deficits seem evident, limited theory or evidence is available to determine an etiology of attentional deficits or to clarify the confused relationship between attentional disorders and learning failure.

Some empirical and theoretical evidence exists, however, which affirms a relationship between attention and certain dimensions of the learning environment. This evidence was examined for both normal and learning disabled populations. Some consistent trends were enumerated in the literature:

Dimensions Of The Task:

-Studies examining the relationship between the pace of a task and attention have shown that faster paced tasks and more intense lessons tend to increase attention in normal populations; for learning disabled populations the evidence on pace is conflicting and inconclusive.

-Investigators researching the effects of degrees of task structure on the children's attention and performance generally concur that low achieving and learning disabled children are more attentive to tasks which are highly structured.

-Related to structure, studies investigating the duration of a task have shown that learning disabled children are more attentive, if the task is short and broken into small parts.

-Cueing the child to the tasks with verbal cues and pointing was shown to increase attention of both normal and learning disabled children, but nonverbal gesticulations (like pointing) were found to be more effective than verbal cues.

-Investigators examining the relationship of task complexity and attention found that for low achieving populations difficult tasks produce more off-task behavior than simpler tasks.

- Concerning lesson signal systems, researchers concluded that with normal populations, the more continuous the external provisions (signal systems) of a task, the more on-task behavior exhibited by the child doing the task. Additionally, this research supports the assertion that some tasks on lesson types are more likely to be continuous (and thus produce more task engagement) than others.

Dimensions Of Teacher Communication:

- Studies of the relationship of teachers' instructional communication to children's attention to a task have shown some correlation. However, further delineations of instructional communication categories have produced contradictory results.

- Most investigators in the area of teacher communication conclude that verbal reinforcement of a child's response on a task facilitates that child's attention to the task. There is some evidence that suggests that the reinforcing remark must be descriptive and specific to facilitate attention to the task.

- Quantity of teacher communication, as it relates specifically to attention has not been examined, however, much evidence exists to support the premise that teachers communicate significantly more with children who are high-achievers than with low-achievers.

Dimensions Of The Setting:

- The major finding related to setting was in the area of teacher-child ratio. Smaller class sizes and smaller group sizes promote more attention behavior.

- Though attention to a task has not been examined as a function of group size in a resource setting, research on academic performance seems to indicate that a ratio of 1:1 produces superior academic performance over any other small group ratio up to 1:5. No marked differences were noted for academic performance between ratios 1:2, 1:3, 1:4, and 1:5.

CHAPTER III

METHODS AND PROCEDURES

The review of the present literature has shown that problems of attention are instrumental to the learning failure of learning disabled children. In an era when educators are attempting to provide "appropriate" educational services for exceptional children, research concerning the effects of specific variables within the learning environment upon the attention of such children is critical. Without systematic investigation of what is actually happening within the learning environment--i.e., "transducer" research according to Barker (1965) or investigation of "transactional" variables (Stake, 1967; Karnes, 1975; Gallagher, 1976)--educational researchers and decision-makers will not be able to recommend "appropriate" services for learning disabled children.

Additionally, the review of the present literature has shown that within the learning environment certain variables are related to the child's attention to the learning tasks. These variables within the lessons, within the teachers' communications, or within the classroom setting are all manipulable and, therefore, could be altered and orchestrated to provide more "appropriate" interventions for the learning disabled child.

To reiterate the main purposes of the study which were discussed earlier, they were:

1) To examine the relationship between certain types of formal lessons within a resource setting and the attention to those lessons of the learning disabled children participating in them.

2) To examine the effects of certain classroom milieu variables on the attention of the children in those settings.

3) To investigate the impact of the frequency of certain types of communications from the teacher to the child on the child's attention to the task or lesson.

4) To explore the applicability of naturalistic methods of ecological psychology to the study of behaviors of learning disabled children and to the study of special education interventions.

Population

Thirty-five children, who were labeled as "learning disabled" and who were receiving special educational services, were observed in the study. These children were identified by their school administration or the school's special services committee as learning disabled according to a discrepancy rationale--having average intelligence but below average academic performance (Gearheart, 1977). This discrepancy was usually, but not always, evidenced in reading.

All but three of the children were observed in resource room settings located within regular public elementary schools. Three of the children were seen in the resource room of a private school facility. They were chosen for the study based on having:

1) administrative classification of learning disabled;
2) confirmation of test scores that the child was of average intelligence (IQ above 80) and below average academic performance (total or reading achievement 9 months below age norms);
3) programs in which they were receiving at least 25 minutes of remediation three days per week;
4) permission from the parents to participate in the study.

The average child was white, male, 9 years old, and one school year behind in academic performance. The children ranged in age from 7 to 10 and were in grades 2-5. There were 22 whites and 13 blacks, 26 males and 9 females observed, which represents a population typical of learning disabilities programs in the State of North Carolina (Borders-Patterson, et al., 1974).

For the study population the average IQ score on the WISC was 96.0, and the average child was below his or her age norms in academic performance by 9.0 months for overall achievement and 8.1 months for reading achievement. These psychometric characteristics are typical of the learning disabled population within the state (George, et al., 1975).

Table I displays this demographic and psychometric data for the study population.

Setting

Each learning disabled child was seen in a school resource setting to which he or she came from the regular classroom. The usual resource service for each child was provided for 30 minutes, 5 days a week--but this varied between 25 and 40 minutes, and 4 to 5 days a week. The number of children in the lesson group varied from 1 to 3 and the teacher-child ratio varied from 1:1 to 1:3. There were 7 different resource settings in 6 different elementary schools used in this study. Five were regular public schools and one was a private school.

Lessons were chosen and planned by the resource room teachers. No attempt was made to influence the teachers' choices or executions of any lessons. The

TABLE I

CHILD CHARACTERISTICS

(N=35)

SEX	M = 26	F = 9
RACE	W = 22	B = 13
AGE (months)	$\bar{x}$ = 107.0	r = 82-128 σ = 14.296
GRADE	$\bar{x}$ = 3.4	r = 2-5 σ = .083
IQ	$\bar{x}$ = 96.0	r = 79-145 σ = 16.515
ACHIEVEMENT (Total)	$\bar{x}$ = -0.90	r = -1.5 to +.2 σ = .433
ACHIEVEMENT (Reading)	$\bar{x}$ = -0.81	r = -1.8 to +.1 σ = .520

* $\bar{x}$ is used to represent the mean
** r is used to represent the range

lessons were diverse in content and utilization of materials both between teachers and for any one teacher with different children.

The resource room settings were very similar. The rooms were smaller than regular classrooms. The rooms were equipped with multiple child work-tables, though each setting had individual workspace for each child. The rooms were low in clutter and visually stimulating materials. Each setting had one special education teacher/therapist. We did not observe when volunteer aides, parents, student teachers, or other observers were present in these resource rooms.

Teachers

The seven resource room teachers were all white females. Each had, at least, a Master's degree and were certified in the area of Learning Disabilities, with one exception. One teacher was certified in Mental Retardation. Each teacher had between 3 and 7 years of experience in special education and each was recommended by her supervisor for participation in this study. Supervisor judgement, recommended by Scott(1977), was used simply as a convenient means of obtaining some general effectiveness criterion.

Observation Procedures

A total of 140 (24 minute) observations were taken of these children in the resource room settings. Each child was observed for four visits of 24 minutes each (the first visit was an orientation/adaptation visit). Data was taken in the last three visits. The coding form used uring these observations is available in Appendix A.

First, using the regime advocated by Scott (1977), orientation was accomplished by taking the observation equipment (tape recorders, observers, and clip boards, etc.) to the resource room. The role of the observers was explained to the children, and they were permitted to ask questions or examine the recording equipment. It was explained that the observer's job was to watch the teacher and the child's job was to ignore the observer.

Adaptation was accomplished by the observers' engaging in all the behaviors which were to occur later in the actual observations. These behaviors included watching the child, putting the timer recorder into play, placing the tape recorder on the lesson table, and simulating the recording of data on the code sheets. In all cases, these procedures were sufficient to orient and adapt the children and their teachers to the observation procedures so that their behavior settled to as near normal as possible and so that they did ignore the observer.

Child behaviors were observed and recorded every 10 seconds for 5 minutes. There was a 1 minute pause, then the observation resumed for another 5 minutes until 20 minutes of observation time was recorded for that visit. This was repeated for 3 visits. Each child's behavior was coded, relative to the assigned task, as being either on-task, off-task, or inappropriately on-task.

Lesson types were observed and recorded simultaneously with child behavior every 10 seconds. The same 5 minute intervals with a 1 minute pause were used. Observed categories with a duration of 10 seconds or less were not coded. It has been shown in earlier research that an interruption of one lesson mode by another does not alter the first unless the interruption is of greater duration than 10 seconds (kounin and Doyle, 1975).

Classroom milieu codes were observed and recorded during the 1 minute pause between the 5 minute observations. A summary classification of these codes was made on teacher role, ownership of the task, pupil work interaction, and source of pacing, and was generalized over the 5 minute block.

Teacher communications were recorded on audiotapes which were coded post observation. The tape-recorder was concealed in a box which was placed on the child's worktable. A running notation on the code sheet, noting with whom the teacher was interacting, was done to aid in the coding of these communication tapes.

Observations were made over the course of one school semester.

Ecological Methodology: A Restatement

At this point, it may be necessary to reiterate briefly the focus of the data gathering methodology. Barker (1965) called it "transducer" research. Willems and Rausch (1968), Kounin (1977), and Gump (1976) refer to it as "naturalistic" research. Myrtle Scott calls this research methodology "ecological" (1978).

The two major components of the ecological or naturalistic focus are the standing pattern of behavior (addressed by the signal system focus of the lesson type analysis in this study) and the milieu (addressed by the classroom milieu analysis part of this study). Gump (1976) describes the ecological factors of the child care situation primarily in milieu terms as including the number of caretakers, the number and age mix of the children, amount and kinds of play materials, and the general child activities supported by the situation. Kounin (1977) added the standing patterns of behavior associated with each activity and program as a separate ecological component.

The patterns of behavior are the regime, set of procedures, or way of doing things in that "program."

Barker, a pioneer in the field of ecological psychology, had earlier coined the term "synomorph" or "behavior setting" to describe the milieu-with-behavior interaction that is the cross of Gump's and Kounin's theories. Several characteristics of these behavior settings are important for our purposes. First, they are objective, observable realities. Second, they are bounded contexts existing apart from any single person's presence or perception (Gump, 1976). Behavior settings are environments where children live. The child, once in the setting, is markedly influenced by his standing behavior patterns and milieu. This point of view argues that the child's behavioral opportunities and constraints come primarily from the setting.

Kounin contrasts naturalistic research with more "classical" or experimental research (1977). Ecological methods are for "real life" settings populated by real life children--not "subjects" in experiments, Kounin argues. Naturalistic research differs from experimental research by the degree to which there are restraints either on what is put into and taken out of the inquiry. Ecological methods demands no alteration of the environment to be observed. Additionally, Kounin stresses data gathering that places a value upon completeness, and not only upon objectivity. Completeness refers to the degree to which the data includes all that an event possesses and all that affects a behavior setting. For the purposes of this study, an attempt at completeness was made in observing the child's behavior within the context of the lesson, the milieu, and the communication systems of that classroom setting.

The research contributions from ecological methodology to the fields of educational psychology and special education are, then, ways of delineating natural sections of the child's environment (in this case the special class remediation program). Gallagher (1975) and Karnes (1975) have emphasized the need for concentrating on classroom transactions, i.e., what is actually going on in these intervention programs. Ecological methods provide one strategy toward that goal.

Dependent Variables And Their Measures

Classifications of the dependent variable of child behavior were straightforward. Because resource teachers intend their lessons and their communications to engage the child, the degree to which these lessons and communications held the attention of the child was measured simply--a child's behavior was classified relative to his or her engagement in the assigned task. A child's behavior was categorized in one of the following ways:

> On-Task. This was coded when the child was clearly engaged in the official, assigned task in a manner appropriate to the lesson. The engagement may have been active (e.g., reading, responding, etc.) or passive (listening, monitoring, waiting, etc.).
>
> Off-Task. This was coded when the child was not engaged in the assigned task, but showed no overt signs of misbehaving or being inappropriately engaged in another activity.
>
> Inappropriately involved. This was coded when the child was actively involved in an unofficial, unassigned or deviant activity. Performing poorly or making an error was not coded as inappropriate engagement. Examples of behavior in this category are drawing on work or inappropriate help-seeking.

As a data reduction technique for analysis purposes, the "inappropriate" category, which was rarely observed and, actually, a variation of "off-task," was combined with the off - task behavior category. The child was, then, either on-task or off-task at every coded interval.

The dependent variable, used in the analyses, is the proportion of on-task behavior (in some cases the actual frequencies were used in the analyses) for 1) each Lesson Type, 2) each level of the Classroom Milieu Codes, and 3) each Teacher Communication category.

Independent Variables

Lesson Types

The categorization of the lessons was an adaptation of work by Kounin and Gump (1974) and Kounin and Doyle (1975) in which they had tried to discriminate lessons as types or wholes rather than single, undimensional variables within lessons. As one observes a child in a lesson, it becomes clear that his or her actions are focused, directed and supported by the external provisions of the lesson. The external provisions include the props, the communications of the teacher, and the standing behavior pattern that goes with the lesson. Kounin labels the external provisions which signal a child's actions as "signal systems" (1974). This concept was discussed earlier in Chapter II under "Dimensions of the Task."

One of the ways lessons can be categorized is in the pattern of their signal systems. Because signal systems are like the rules of a game and demand a standing behavior pattern, they are repetitive. One can assume that when lesson type x appears a second time, it has a signal system which also appears, and is supportive of a standing behavior pattern, which appeared in the first instance and will reoccur in the second.

The lesson categories in this study were patterned after Kounin and Gump's signal source model. However, because formal lessons within a learning disabilities resource room are somewhat different than in regular preschool settings observed by these investigators, the categories employed in this study were adapted appropriately.

The signal systems for the lesson types differed along two dimensions: single or multiple sources and steady or shifting continuity. Illustrating the concept of single, continuous signal source--a single, continuous emission of signals is exhibited when the materials, the headphones, or a demonstrating teacher provides persistent signals for the child and invites constant attention. In terms of the signal system concept, a teacher reading a book to a child or small group of children calls for a single, continuous source of signal emission. In this case, the format is manned by one central occupant as the signal source and produces a continuing signal flow to the children. As hypothesized, this format should yield high task engagement or low off-task behavior.

In contrast to the single, continuous signal system is the multiple, shifting system. In this case, some of the major signals are provided by other children. Such multiple, shifting signal sources are present in group recitations, group play, "follow-up" activities, and transition activities.

Formal lessons within the resource room were categorized into six types. A protocal for the classification of lesson types is available in Appendix B.

Lesson types were categorized in the following ways:

> Self construction/manipulation (LTYPE 1). As the child manipulates the props as assigned, the major signals come from the materials and the child's actions upon them. These actions upon the materials signal further actions. Examples include a child copying writing samples or a child constructing a sheet of words beginning with a certain letter.
>
> Listen/monitor (LTYPE 2). The major signals come from external, continuous sources like the teacher or a reading machine. Examples of this lesson type include a teacher demonstrating how a technique is done, a teacher

reading to a child or group of children, or a child under headphones connected to a tape or record player.

Recitation 1:1 (LTYPE 3). The teacher sequences and paces signals to an individual child. Here the major signals will come from the teacher though props may be used. An example is a teacher drilling a child on a letter recognition task.

Recitation 1:2 or 1:3 (LTYPE 4). This multiple child recitation session is characterized by signals which are shared between the teacher and other children. In this lesson type, a teacher's focus will be on more than one child at a time. An example of this type is a teacher asking questions of a small group about material previously read.

Play/interact (LTYPE 5). Major signals are shared by the teacher and children or primarily by children. Game playing, follow-up activities (learning games common in an LD resource room), and group activities are examples of this lesson type.

Transition (LTYPE 6). Signals are shared by the teacher, the other children, and props during transition. Lag time, post-task completion time, and interruptions were coded as transition. In each resource room, and in each transition, there was an appropriate standing behavior pattern expected (which could be passive waiting, moving on to the next task, or putting away the props/materials). Kounin and Gump (1974) and Kounin and Doyle (1975) suggest, however, that transition is time when the signals are "off."

Classroom Milieu

The second group of independent variables are the Classroom Milieu Variables. The categorization of Classroom Milieu Variables was adapted from work by McKinney (1977) and Morrison and Oxford (1977). The milieu categories attempted to summarize the setting observed over the five minutes prior to the coding. The classroom milieu categories were designed to tap other sources of variation not associated or addressed by the lesson type analysis, but no attempt was made to integrate the two concepts. The matching dependent variable of on-task behavior was summed from the 10-second observations for the matching five-minute intervals. The categories of the classroom milieu codes were:

Teacher role. The child was recorded as being in one of the following settings, with respect to teacher role, with the teacher as:

Leader - Teacher demonstrates, leads recitation, or gives information.

Participator - Teacher does task along with child.

Helper - Teacher rotates among children helping them when they request help.

Onlooker - Teacher is on the periphery of activity but attending to the child.

Ownership of task. Who owns the task and the product was the concept here:

Child's own task: no product - Child works with own material and no product is produced. (e.g., Child reads story).

Child's own task: own product - Child works with own materials and produces a product (e.g., Child completes a worksheet).

Group task: no product - Child is in small group and no product is produced (e.g., Children observing a demonstration).

Group task: product - Child is in small group and group produces a product (e.g., Children completing follow-up game activity).

Pupil work interaction. When the child was in the resource room with other children, one could describe their interaction as:

Interdependent - Child is in an activity necessitating interaction with other children.

Private - Child is working privately whether near other children or not.

Parallel - Child is with other children but not interacting (e.g., Two children are listening to the same tape).

Source of Pacing: The concern in this code was whether the actual pace of the child's performance was dictated by:

Self-source pacing - Child executes task as own readiness dictates.

External-source pacing - Child executes task as the teacher or other external source dictates.

A more detailed protocol and a code sheet for these Classroom Milieu Codes is Available in Appendix C.

Related to Classroom Milieu Variables but coded separately is the variable of Teacher-Child Ratio. Children were observed in one of three situations: 1:1, 1:2, and 1:3. Though the situation might vary for one child from day to day, it was constant for a single observation.

Teacher Communication

Each 24 minute visit was accompanied by an audio tape which recorded all communication from the teacher to the target child for the 20 minutes child behaviors were being coded. An adaptation of a coding scheme used by Jackson and Lahaderne (1967) and revised by Wright and Nuthall (1970) was used. The observation schedule required that an entry be made each time there was an intentional transmission of communication or information from the teacher to the target child. All specific communications made directly to the target child and all general communications made to the group (but intended for the target child inclusively) were coded.

This independent variable generated two different scores--a frequency score (how much a teacher interacts with a child), and a proportion score (what mode or pattern does this communication take).

The categories of teacher communication were coded as:

Instructional Statements:

Structuring	- Teacher supplies information or directions about the instructional task;
Soliciting	- Teacher's statement/ question intends to elicit a verbal or physical response from child;
Reciprocating	- Teacher answers child's instructional question;

Reactional Statements:

Praising or thanking - Teacher reinforces child's response positively;

Challenging or negatively commenting - Teacher reinforces child's response negatively;

Informal Interaction:

Indefinite commenting - Teacher comments to the child with no intent; raps non-judgementally; repeats; thinks aloud;

Talking informally - Teacher talks unrelated to school or task;

Managerial Statements:

Interpreting rules - Teacher clarifies non-task-related rules;

Ordering/Commanding - Teacher gives orders or demands behavior change;

Punishing - Teacher punishes individual or group;

A more detailed protocal and a code sheet for the Teacher Communication categories can be found in Appendix D.

Reliability

Observer reliability was calculated by the percentage agreement method. The observers' coding had to agree by code category and sequence in order for one inter-observer agreement tally to be entered for any 10 second interval on the time-sampled data. Reliability was determined by dividing the number of agreements by the total number of agreements and disagreements (i.e. total number of observed intervals). The reliabilities for the time-sampled data, based on biweekly recalibration checks, were as follows:

CHILD BEHAVIOR Range (.800-.970) Average (.880)
LESSON TYPE Range (.700-.970) Average (.859)

Reliabilities for the Classroom Milieu Codes were also calculated by the percentage agreement method. Similar to the time-sampled data, the observers' code had to agree by code category to obtain one inter-observer agreement. The reliabilities calculated for this measure were:

CLASSROOM MILIEU Range (.800-1.00) Average (.978)

Relaibilities on the Teacher Communication measure were obtained by numbering each statement on a segment of audio tape and requiring the coders to code the number of the statement in its appropriate category. Only the grosser categories of Instructional, Reactional, Informal, and Managerial were used to determine agreement. Reliability was determined by dividing the number of agreements by the total number of agreements and disagreements. The reliabilities calculated for this measure were:

TEACHER COMMUNICATION Range (.810-.900) Average (.867)

Appendices A, B, C, and D contain code sheets and protocols used in the actual data collection.

CHAPTER IV

RESULTS

The statistical analysis evaluated the effect that the variables of lesson types, classroom milieus, and teacher communications had on the dependent measure of attention to a task. The basic unit of analysis used for most of the analyses was the behavior episode which existed within each 10 second block of time the child was observed (Wright, 1967; Barker, 1968; Kounin, 1977; Scott, 1977). The one exception to the behavior episode unit of analysis was in the analysis of the effect of teacher communication on the child's attention to the task. In this case, the data was analyzed by teacher.

In order to examine the dependent variable for extraneous variation due to demographic and psychometric factors related to each child, age, IQ, grade placement, and pre-program achievement scores were correlated with the dependent variable. These correlations, none of which were found to be significant, are reported in Appendix G. Additionally, race and sex were examined to determine if the child behavior of attention to a task differed for these groups. No significant differences were noted and these data are also reported in Appendix G.

Some research evidence exists which demonstrates a relationship between age and attention -- the younger the child, the more off-task behavior exhibited (Gale and Lynn, 1972; Herring and Koch, 1930; Kassinove and Summers, 1968; Routh, Schroeder, and O'Tuama, 1974). Moreover, some evidence exists showing that girls tend to exhibit more task-engagement than boys (Allington, 1975; Keogh, 1971). No significant differences were found in on-task behavior for any subgroups within this sample.

Study Purposes Reviewed

To review the main purposes of the study, they were:

1) To examine the relationship between certain types of formal lessons within a resource setting and the task-related attention of the learning disabled children participating in those lessons.

2) To examine the effects of certain classroom milieu variables on the task-related attention of the children in those settings.

3) To investigate the relationship of certain types of communications from the teacher to the child on the child's attention to the task or lesson

Limitations

Since the investigator exercised no control over the learning environment of the learning disabled children observed in the study, data were not evenly balanced across all lesson categories as they would have been in an experimental situation. Every teacher did not use every type of lesson for every child. An attempt was made to obtain many hours of observations to increase the size of each cell frequency so as to minimize, as much as possible, problems which might be created by this imbalance.

Criticism of this type of observational study notes the statistical dependency problems when one child is repeatedly observed across several learning situation. Each event or behavior episode, it is argued, is strongly affected by the behavior episode of the preceding moments in time and consequently lacks independence (Applebaum, 1978). Many statistical procedures assume that individual events are independent of each other (Isaac and Michael, 1971). In other words, each response must be free of any influence upon the nature of any other response in the set of responses being compared. Because the nature of this study and the nature of this type of data are particularly vulnerable to this criticism of dependency problems, the investigator in this study used the conservative alpha level of .01 to determine significance on all tests and used the minimum degrees of freedom on chi square procedures in which the degrees of freedom were variable.

Summary of the Variables

As a data reduction technique, the dependent measures which included on-task, off-task, and inappropriate behaviors were reduced to:

ON-TASK BEHAVIOR

OFF-TASK BEHAVIOR

The inappropriate category was a code for off-task behavior that did not demonstrate gazing around or daydreaming (which was covered by "off-task"). Because it was essentially a code for off-task behavior and because it was recorded infrequently, it was subsumed into the "off-task" category.

In the analysis of Lesson Types, proportions and frequencies of both ON-TASK and OFF-TASK behaviors were used when appropriate. When tests of proportions were done, only the ON-TASK proportions were used. In the descriptive analysis of the Classroom Milieu Codes, only

ON-TASK proportions were used. In the analysis of Teacher Communication, frequencies of ON-TASK were used when communication frequencies were correlated, and proportions of ON-TASK were used when communication proportions were correlated.

For all the learning disabled children observed during actual formal lessons across all teachers and all lesson types, the mean ON-TASK proportion was found to be .696. This means that the average learning disabled child observed was attending to the task during a formal lesson about 70% of the time.

To review the independent variables used in the study, they are:

LESSON TYPES (Appendix B)

1. Self-Construction/Manipulation
2. Listen/Monitor
3. Recitation 1:1
4. Recitation 1:2 or 1:3
5. Play/Interact
6. Transition

CLASSROOM MILIEU CATEGORIES (Appendix C)

1. Teacher Role (4 levels)
2. Ownership of the Task (4 levels)
3. Pupil Work Interaction (3 levels)
4. Source of Pacing (2 levels)

TEACHER COMMUNICATION (Appendix D)

1. Instructional
2. Reactional
3. Informal
4. Managerial

The effects of each of these independent variables on the dependent measure of attention to a task will be reported measure by measure.

Lesson Type Results

Differences Between Six Lesson Types

The major question addressed by this part of the analysis was whether or not there was a relationship between the six lesson types and the attention of children in these lessons. To determine if a relationship was present, it was necessary to compare the lesson types using a combination or summary chi square procedure.

Combination techniques are used often in epidemiological research when several studies have examined the same association between a factor A and a disease B and an investigator is attempting to determine whether the degree of association is consistent among these studies and to ask if the common degree of association is statistically significant (Fleiss, 1973). To answer these questions, a chi square test combining evidence from the studies is used.

One such combining technique is the Mantel-Haenszel summary chi square procedure used to combine contingency tables (Mantel-Haenszel, 1959). It has the function of allowing an investigator to use as one "study" the individual contingency table based on data for a single subject.

The hypothesis to be tested in this study by this technique is whether the six different lesson types have a differential effect on the child's attention; i.e., does the ratio of on-task to off-task behavior differ across lesson types.

No controls were placed on the learning situations and no attempt was made by the investigators to control the child's exposure to any lesson type. As a result, there were variations in the data for each child -- not every child was exposed to every lesson. The Mantel-Haenszel summary chi square procedure (Mantel and Haenszel, 1959) essentially permits these variations by allowing each deviation (e.g., D_1 shown below) to contribute relative to the number of children or incidence of observations in that lesson type.

The Mantel-Haenszel summary chi square statistic is given by:

$$X^2_{MH} = \frac{D_1 + D_2 + \ldots D_x}{\sqrt{V(D_1)+V(D_2)+\ldots V(D_x)}} = \sum_{i=1} \frac{D_i}{\sqrt{V(D_i)}_{i=1}}$$

In this formula D_i is the difference of observed from expected scores for the i^{th} experiment and $V(D_i)$ is the variance.

In this study the procedures involved, first, the creation of 2 x 6 contingency tables for each child based on the observed frequencies (i.e. frequencies of observed on-task and off-task behaviors across the 6 lesson types for that child). Second, expected frequencies were obtained for each table (Hays, 1973). Third, differences of observed scores from expected scores for each cell of the individual child's 2 x 6 table were obtained. These differences were then summed to create, for example, $D_{1\ on}$ for the on-task by lesson type #1 summary score. Additionally, the variances for these differences were obtained. For this study, the specific Mantel-Haenszel summary chi square statistic was:

$$X^2_{MH} = \frac{D_{1\ on} + D_{2\ on} + \ldots D_{6\ off}}{\sqrt{V(D_{1\ on}) + V(D_{2\ on}) + \ldots V(D_{6\ off})}}$$

Using the Mantel-Haenszel technique and setting a conservative alpha level of .01, it was found that certain lesson types produce significantly more on-task behavior than others, $X^2_{MH} = 39.17$; $\underline{df} = 5$; $p < .001$. These findings, reported in Table II, support a main hypothesis of this study -- that the six lesson types have a differential effect on the child's attention to the lessons.

Consistent with the research on signal system theory (Kounin and Gump, 1974; Kounin and Doyle, 1975; and Rosenthal, 1973), this investigator predicted that lessons in which the signals originate from a single source (e.g., SELF-CONSTRUCTION (#1), LISTEN/MONITOR (#2), and RECITATION 1:1 (#3)) would produce more on-task behavior than lesson types with multiple and shifting signal sources and presence of lags (e.g., RECITATION 1:2/1:3 (#4), PLAY/INTERACT (#5), TRANSITION (#6)).

Figure II displays the proportion of on-task behavior observed for each of these six lesson types. The proportion of on-task behavior was derived by dividing the actual frequency of ten-second blocks observed in lesson type x into the frequency of observed ten-second blocks coded as on-task behavior for lesson type x.

As can be ascertained visually from Figure II, it appears that there is some trend in ON-TASK behavior across lesson types with LISTEN/MONITOR lesson type producing the most on-task behavior and TRANSITION producing the least on-task behavior.

Lesson Type 1, SELF-CONSTRUCTION/MANIPULATION, produced an on-task behavior proportion of .777, and was the most often observed lesson category. The theoretical derivations of the lesson type classifications (Kounin, 1977) suggest that individual construction lessons, because they contain the most continuous signals and the signals come from each child's own action upon his or her own work, would promote the most on-task behavior. However, in terms of successfully inducing or supporting appropriate task involvement, the individual construction lessons, though perhaps effective arrangements for this

TABLE II

FREQUENCIES OF CHILD BEHAVIOR BY LESSON TYPE

LESSON TYPE	# OBSERVATIONS	ON-TASK	OFF-TASK
1 SELF-CONSTRUCTION	4312	3352 (.777)	960 (.223)
2 LISTEN/MONITOR	416	361 (.868)	55 (.132)
3 1:1 RECITATION	3602	2923 (.811)	679 (.189)
4 1:2,3 RECITATION	1605	1065 (.645)	585 (.355)
5 PLAY/INTERACT	615	390 (.634)	225 (.366)
6 TRANSITION	2091	796 (.381)	1295 (.619)

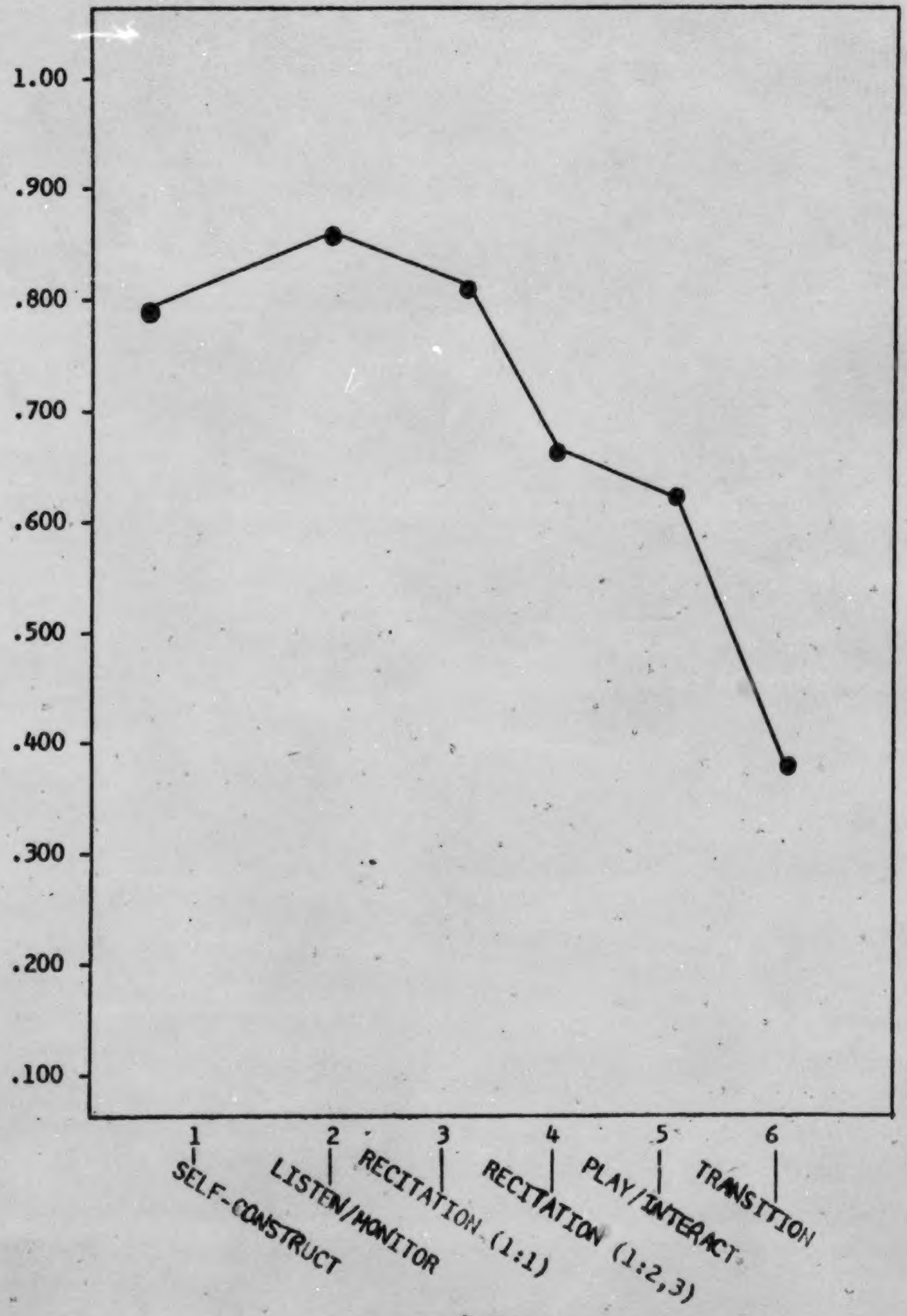
$X^2_{MH} = 39.17$, $\underline{df} = 5$, $p < .001$

* Proportions are in parentheses

** The Chi Square statistic used is the Mantel Haenzel technique (Fleiss, 1973; Mantel, 1959, 1963, 1966)

FIGURE II

PROPORTIONS OF ON-TASK BEHAVIOR BY LESSON TYPE



population, were not the most successful observed in this study. Learning disabled children may differ from the normal populations used in previous signal systems research in that they may be less able to work alone. Further discussion of this finding will be dealt with in Chapter Five.

Lesson Type 2, LISTEN/MONITOR, with an ON-TASK behavior proportion of .868, produced the most task involvement. The children observed in this study were, indeed, engaged successfully under the headphones or by a demonstration, however, this lesson type category was observed relatively infrequently in the resource rooms. Table II reports this frequency data.

Lesson Type 3, RECITATION 1:1, produced an ON-TASK proportion of .811. Though this proportion was lower than that produced by the LISTEN/MONITOR lesson type, the Lesson Type 3 category was observed more frequently. Type 3 lessons possess a high degree of continuity and the signals come from the teacher to the one child in the recitation session. As was expected, this lesson type yielded a higher degree of task engagement than the following 3 lesson types.

Lesson Type 4, RECITATION 1:2 or 1:3, differs from Lesson Type 3 in that the teacher is in a multiple recitation session with more than one child. The teacher, according to signal system theory, would share the signal emissions with children who are potentially faltering or lack command of attention, and lags or discontinuity would result. As was expected, the proportion of ON-TASK behavior, .645, was lower than Lesson Types 1, 2, or 3.

Lesson Type 5, PLAY/INTERACT, usually occurred in a followup activity to a multiple recitation session. Here the teacher shared the emissions of signals more with the children participating and less continuity was present in the lesson. This lesson type yielded an ON-TASK proportion of .634. Lesson Type 5, though seen more than Lesson Type 2, was not frequently observed.

Lesson Type 6, TRANSITION, produced the least ON-TASK behavior of all the other categories, .381. The inadequate or confused signals resulted in a vulnerability to inappropriate behavior. The TRANSITION observations occurred within the formal lesson time, and do not reflect normal "settling down" time or class beginning or ending lags.

Differences Between Clusters of Lesson Types

Support exists within signal systems theory for noting and examining the differences between the clusters of Lesson Types 1,2,3 and Lesson Types 4,5,6. One hypothesis is that lessons in which the signals come from a continuous single emitter--the child himself

TABLE III

PROPORTIONS TEST OF ON-TASK BEHAVIOR FOR TWO GROUPS OF LESSON TYPES

LESSON TYPE	# OBSERVATIONS	# ON-TASK	# OFF-TASK	% ON-TASK
1,2,3	8330	6636	1694	.800
4,5,6	4356	2251	1105	.520

$X^2 = 160.21$, df = 5 or 35, $p < .001$

*The degrees in this Chi Square test are variable; 35 is the least conservative and 5 is the most conservative;

**The proportion test used here is reported by Fleiss, 1973.

(SELF-CONSTRUCTION/MANIPULATION), the voice in the headphones (LISTEN/MONITOR) or the teacher alone (RECITATION 1:1)--produce more on-task behavior than lessons with multiple and shifting emitters--teacher and children sharing signals (RECITATION 1:2 or 1:3 or PLAY/INTERACT) and signals unclear (TRANSITION).

To test this hypothesis a proportions test was done comparing the proportions of on-task behavior for Lesson Types 1,2,3 and Lesson Types 4,5,6 (Fleiss, 1973). The combined proportion of ON-TASK behavior for the first group (.800) differed from that of the second group (.520) significantly, $X^2 = 160.21$; $\underline{df} = 5$; $p < .001$. Table III displays this data.

The results presented here, then, suggest that lessons can be categorized according to signal systems. Describing the source and continuity of signals and calling for a standing behavior pattern, these signal systems are properties of lessons and may be crucial in predicting the child's attention to these prescribed lessons.

Classroom Milieu Variables Results

The question addressed by the examination of classroom milieu variables was whether on-task behavior differed under different conditions of TEACHER ROLE, OWNERSHIP OF THE TASK, PUPIL INTERACTION, and SOURCE OF PACING.

These milieu data were gathered using a coding scheme which was employed every five minutes during the observation (Appendix C). The corresponding dependent measure was the proportion of on-task behavior for that same five minute block. A similar version of the classroom milieu scheme had been used by investigators Morrison and Oxford (1977) who concluded that it was too detailed a coding scheme, when used every six seconds, to record actual classroom milieu. This investigator chose to use the coding scheme as a summary device to record larger or grosser setting variables occurring within the five minute observation period.

The results of this analysis of Classroom Milieu variables using the coding scheme in a summary mode, was that little variation was shown between categories. Twice, when obvious variation did occur, it was due to categories which were infrequently observed. It appears that too many changes in the classroom milieu occur within a five minute segment to effectively summarize the characteristics of that milieu. If differences do exist between the categories, employing the coding scheme every five minutes, instead of simultaneously with the time-sampled child behavior observation, is insufficient to note those differences.

These data are presented descriptively in Tables IV-VII and Figures IV-VII. The proportions of on-task behavior are given for each of the classroom milieu categories. Because of the difficulty in interpreting significance using the summary data, statistical tests were not employed in this analysis.

Teacher Role

Table IV shows that the teacher role category of HELPER, coded when the teacher rotated among children working on their own tasks in the resource room, was seen as the role enhancing the most on-task behavior (.773).

The teacher as a PARTICIPATOR, coded when a teacher was one player of several in a follow-up game activity, was noted as the role which least enhanced on-task behavior (.604).

The differences between the role of helper and the role of participator could, perhaps, be explained using signal systems theory. When the teacher is a helper, the child is usually receiving the signals continually from the materials, except when the teacher interjects an infrequent signal. When the teacher is a participator, the teacher usually shares signals with other children. However, an explanation of the differences between the teacher roles of helper and onlooker, both occurring when a child is working alone, does not easily fit the signal systems theory.

Figure IV illustrates on-task behavior for the

TABLE IV

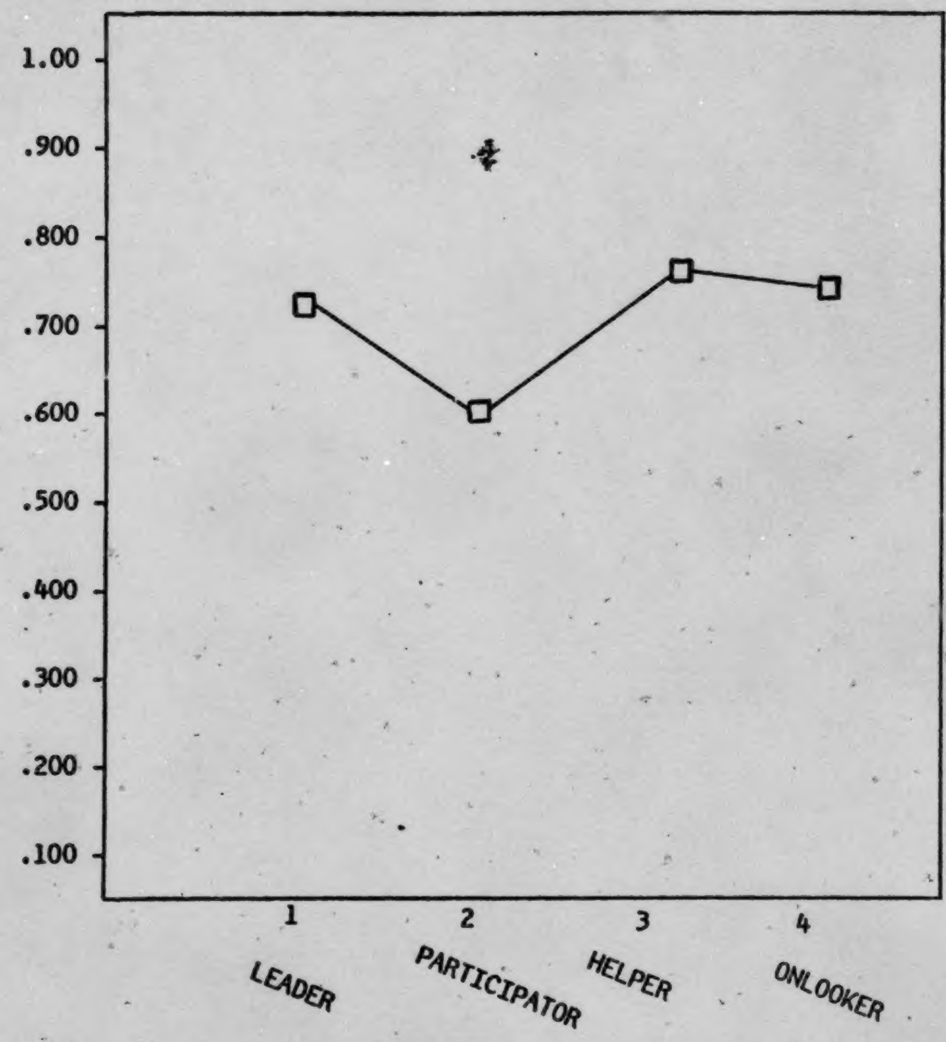
CHILD BEHAVIOR BY TEACHER ROLES FREQUENCIES AND PROPORTIONS

TEACHER ROLE	ON-TASK	OFF-TASK
LEADER (1)	4169 (.720)	1621 (.280)
PARTICIPATOR (2)	597 (.604)	393 (.396)
HELPER (3)	2389 (.773)	701 (.227)
ONLOOKER (4)	1898 (.736)	682 (.264)

* Proportions are in parentheses

FIGURE IV

CHILD BEHAVIOR AND TEACHER ROLES -
ON-TASK PROPORTIONS



different teacher roles.

Ownership of the Task

Table V and Figure V display the finding that the child working with his OWN TASK : NO PRODUCT had the most on-task behavior (.762). An example of this category -- listening under the headphones to a story and having no accompanying assignment -- illustrates its similarity to the Listen/Monitor lesson type of the signal systems model. Using signal systems theory, one would expect high on-task behavior.

A child working on a GROUP TASK : GROUP PRODUCT had the least on-task behavior (.492). Using signal systems theory again, one can see the relationship between this type of task and the Play/Interact lesson type in which one would expect low on-task behavior. The problem with interpreting the meaning of the low on-task behavior for this category of task ownership, is that it was rarely observed in the resource room.

Pupil Interaction

The analysis of pupil work interaction (Table VI and Figure VI) shows that the category of PRIVATE, coded when a child was in the resource room with other children but was working on his own private work, received the highest on-task ratings (.749). Private work exhibited higher on-task proportions than PARALLEL (.684), coded when a

TABLE V

CHILD BEHAVIOR AND OWNERSHIP OF TASK FREQUENCIES AND PROPORTIONS

OWNERSHIP OF TASK	ON-TASK	OFF-TASK
OWN TASK : NO PRODUCT (1)	3291 (.762)	1029 (.238)
OWN TASK : OWN PRODUCT (2)	4871 (.728)	1819 (.272)
GROUP TASK : NO PRODUCT (3)	973 (.721)	377 (.279)
GROUP TASK : GROUP PRODUCT (4)	118 (.492)	122 (.508)

*Proportions are in parentheses

FIGURE V

CHILD BEHAVIOR AND OWNERSHIP OF TASK -
ON-TASK PROPORTIONS

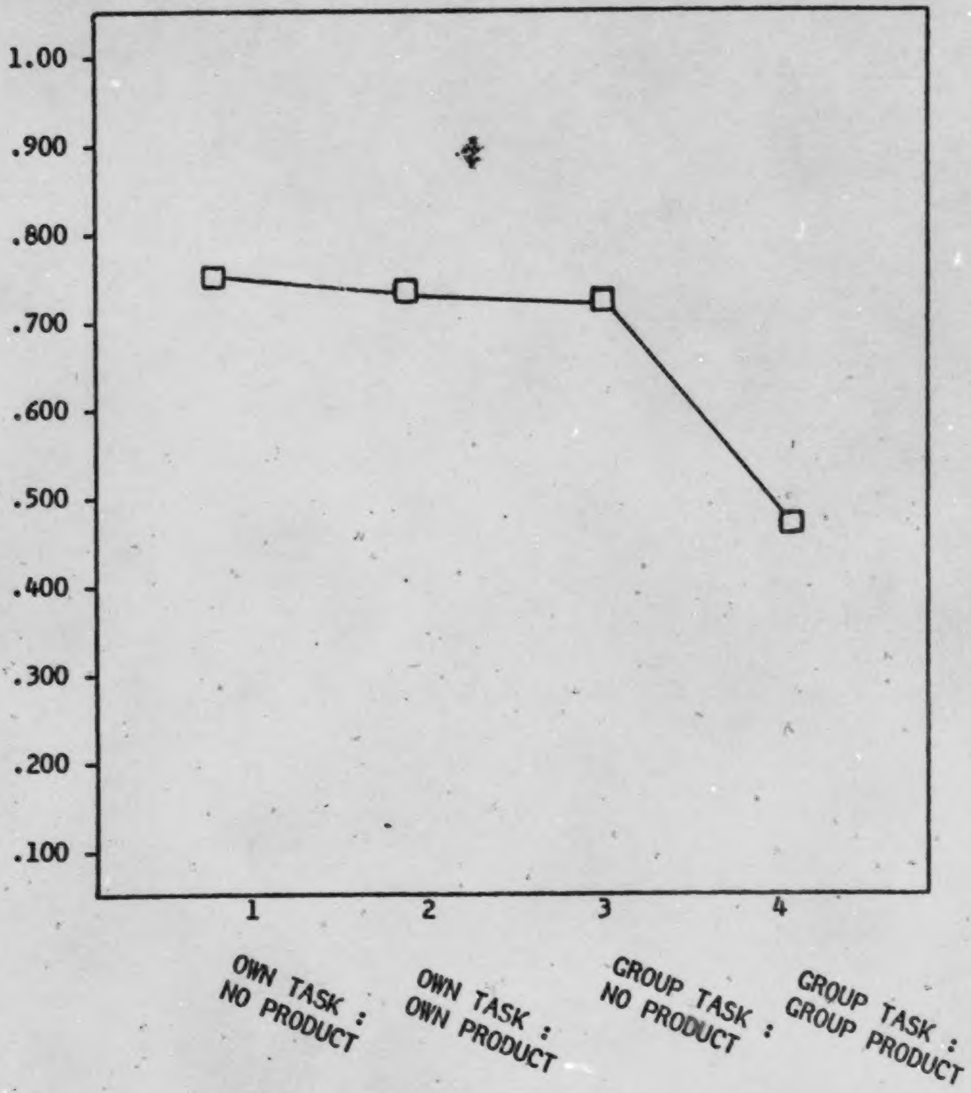


TABLE VI

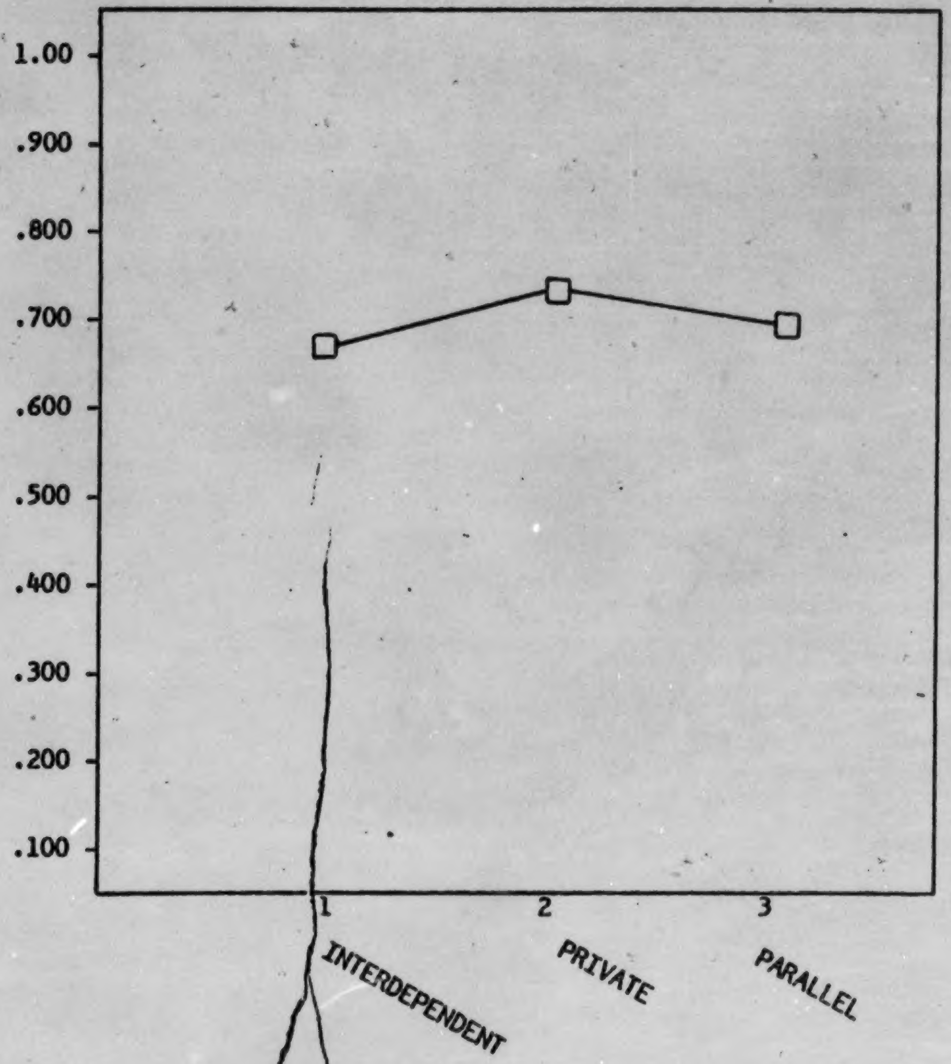
CHILD BEHAVIOR BY PUPIL INTERACTION FREQUENCIES AND PROPORTIONS

PUPIL INTERACTION	ON-TASK	OFF-TASK
INTERDEPENDENT	1115 (.676)	535 (.342)
PRIVATE	7615 (.749)	2555 (.251)
PARALLEL	513 (.684)	237 (.316)

*Proportions are in parentheses

FIGURE VI

CHILD BEHAVIOR BY PUPIL INTERACTION -
ON-TASK PROPORTIONS



child was watching or listening in a group, and INTERDEPENDENT (.679), coded when a child was working with one or more other children.

Source of Pacing

Table VII and Figure VII display on-task behavior for the pacing categories of SELF-PACING and EXTERNAL-PACING. Self-pacing produced a proportion of .709 and external-pacing produced a proportion of .696. Some research evidence exists supporting the hypothesis that if a child has control over the pace of a task, he will be more attentive to that task (Douglas, 1974; Cronbach and Snow, 1977). No differences were apparent for self-paced tasks in this analysis.

Teacher-Child Ratio

In this analysis, the major question was whether on-task behavior differed as a function of TEACHER-CHILD RATIO. Each observed learning environment was classified as having a teacher-child ratio of 1:1, 1:2, or 1:3. Most of the children were seen in the small group situation of 1:3.

Some research evidence has suggested that academic achievement, as an outcome of the resource room, is related to teacher-child ratio (Moody, Bausell, and Jenkins, 1973). Other evidence suggests that a 1:1 ratio

TABLE VII

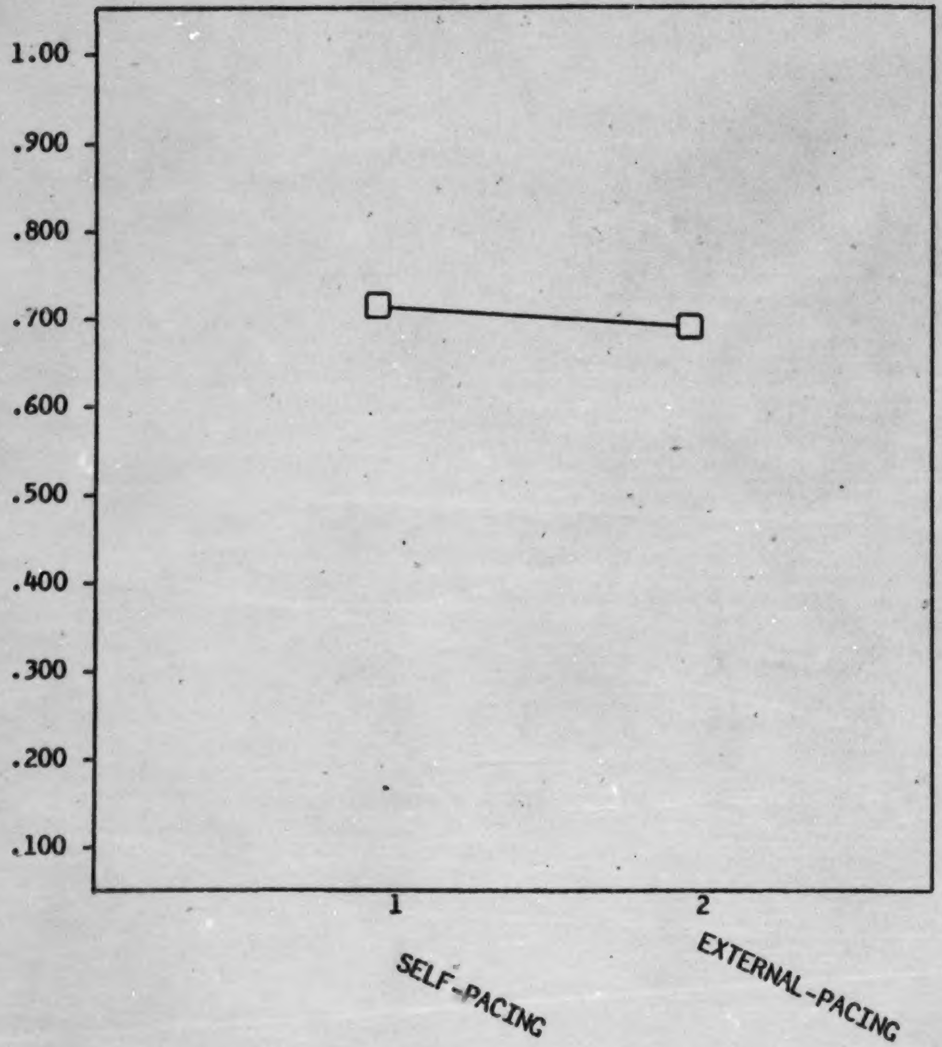
CHILD BEHAVIOR AND SOURCES OF PACING FREQUENCIES AND PROPORTIONS

SOURCES OF PACING	ON-TASK	OFF-TASK
SELF-PACING	3594 (.709)	1476 (.291)
EXTERNAL-PACING	5240 (.696)	2289 (.304)

*Proportions are in parentheses

FIGURE VII

CHILD BEHAVIOR AND SOURCES OF PACING - ON-TASK PROPORTIONS



promotes the highest achievement gains, and that small group ratios greater than 1:1 do not differ in their effect on achievement gains (Jenkins, Mayhall, and Jenkins, 1974).

Extrapolations from these findings might indicate that teacher-child ratio would affect attention behavior. To test this hypothesis, one-way analysis of variance was done comparing each of the three ratio groups (Table VIII). It was found that these ratio groups differed significantly in on-task behavior, F (2,32) = 15.31, $p < .001$.

Given the significance of the overall F test, it was necessary to explore the data to find the source of the differences between the ratio groups. Tukey's multiple comparison t tests (Tukey, 1949; Kirk, 1968) was used for testing the significance of these post hoc comparisons. Though all possible pairwise comparisons are allowable using the Tukey test, only three were performed in order to find the source of the effects.

A significant difference was found for on-task behavior between the 1:1 ratio group and the combined ratio groups 1:2 and 1:3, $t = 5.27$, $df = 34$, $p < .001$.

Additionally, a significant difference was seen between the 1:1 ratio group and the 1:2 ratio group, $t = 2.30$, $df = 10$, $p < .034$. No significant differences were noted between the 1:2 and 1:3 ratio groups.

TABLE VIII

ON-TASK BEHAVIOR BY TEACHER-CHILD RATIOS
ANALYSIS OF VARIANCE

TEACHER-CHILD RATIO	ON-TASK MEAN	F VALUE
1 : 1 (n = 8)	217.37 $\sigma = 12.49$	15.31 $p < .001$
1 : 2 (n = 4)	175.25 $\sigma = 15.35$	
1 : 3 (n = 23)	123.91 $\sigma = 9.152$	

TABLE IX

ON-TASK BEHAVIOR BY TEACHER-CHILD RATIOS TUKEY'S MULTIPLE t TESTS

	1 : 1	1 : 2	1 : 3
1 : 1		$t = 2.30$* *df* = 10	
1 : 2			$t = 1.43$** *df* = 25

* $p < .034$
** $p < .166$
*** When Ratio 1:1 was compared to the combined ratio groups 1:2 and 1:3, t value = 5.27, *df* = 34, $p < .001$

In summary, these findings support the hypothesis that TEACHER-CHILD RATIO affects ON-TASK behavior. The 1:1 ratio group was superior to the other groups in promoting on-task behavior. Once the teacher-child ratio was larger than 1:1, no differences in on-task behavior were observed for the ratio groups. Table VIII and Table IX display the Teacher-Child Ratio data.

Teacher Communication Results

Teacher Communication was the next set of variables examined in the resource room. Some evidence in the literature suggests that the quantity of teacher talk is related to the task engagement of students (Hess and Takanishi, 1974; Englemann, 1969; Walker, 1968; Berliner, 1977).

Other researchers have concluded that it is the quantity of instructional communication that is the most critical variable (Wright and Nuthall, 1970). Others have posited that reinforcement or reactional communication accounts for most of the variance in task engagement of children (Geller, et. al., 1975; Cossairt, Hall, and Hopkins, 1973; Walker and Hops, 1975; Patterson, 1965). Moreover, Cronbach and Snow (1977) assert that differences in the nature of teacher communications affect low achievers more than normal achievers. All of these researchers concur that teacher communication is an important dimension of the learning environment and is significantly related to the child's attention.

The main purpose addressed by the analyses in this section is to determine if there is a correlation between certain types of teacher communication and the on-task behavior of learning disabled children.

Frequency of Communication Types

In examining the quantity and nature of teacher communications, one of the most obvious findings was that some teachers communicated with the learning disabled children in their resource rooms more than others. Note the TOTAL communication mean scores displayed in Table X. Teacher #1, with a mean score of 515.5 communications per child, had about two and a half times as many communications per child as Teacher #4, with a mean score of 210.0 communications per child. What that means operationally is that Teacher #1 interacts with each child about 9 times per minute, while Teacher #4 interacts with each child about 3 times per minute.

INSTRUCTIONAL communication, coded when the teacher was engaged in structuring a task or soliciting instructional responses from a child, varied across teachers. Teacher #5, with an instructional mean score of 245.0 per child, made an instructional statement to an individual child on an average of about 4.1 times per minute. Teacher #4, who had an instructional mean score of 105.3, communicated instructionally with a child less than 1.75 times per minute. Though one might expect these disparities in communication to be related to the number of children in the resource room demanding the teacher's attention, in fact, the teacher with the highest instructional score had the highest teacher-child ratio.

REACTIONAL communication, which was coded when the teacher praised or reinforced the child's responses, differed in quantity among the seven teachers as well. The teacher with the highest number of reactions (166.25 per child) had over three times as many statements in this category as the teacher with the lowest number (51.0 per child).

INFORMAL communication, coded when the teacher was talking unrelated to the task or school situation, was a relatively infrequent occurrence within the formal lesson. With the exception of one teacher, most of the teachers interacted informally with a child less than 1 time per minute.

MANAGERIAL communication was also infrequent. On an average, teachers communicated prohibitory or punitive statements less than 4 times in an entire class period. If this communication score is an indication of disciplinary problems or control, the learning disabled child

TABLE X

TEACHER COMMUNICATION FREQUENCIES* BY CATEGORY

COMMUNICATION CATEGORY	TEACHER						
	1	2	3	4	5	6	7
INSTRUCTIONAL	221.33	123.20	159.00	105.33	245.00	113.00	132.50
REACTIONAL	166.25	58.40	84.75	51.00	85.00	61.50	61.83
INFORMAL	118.00	39.20	63.00	37.00	40.00	59.50	64.67
MANAGERIAL	9.92	10.20	15.25	16.67	13.33	12.50	22.00
TOTAL	515.50	231.00	322.00	210.00	383.33	246.50	281.00

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* The frequencies used are mean frequencies derived by dividing actual frequencies by the number of children for each teacher.

is clearly not the management problem in the resource room that he or she is reported to be in the regular classroom. It is more likely that passive inattention rather than gross behavioral disorders is the key to the learning disabled child's successful or unsuccessful utilization of special education remediation.

Relationship to On-task Behavior

In order to examine the relationship of the quantity of teacher communication to the on-task behavior of the children, a series of Pearson Product-Moment Correlations were obtained. The Pearson correlation (r) is generally used to determine if there is a relationship between two sets of paired numbers (Bruning and Kintz, 1977). In this case correlations were obtained to determine a relationship between the per child mean frequency of teacher communication in each category and the per child mean frequency of on-task behavior.

The dependent measure used in this analysis was the mean frequency of on-task behavior for the children of each teacher. These frequencies of on-task behavior are contained in Table XI.

The Pearson analysis showed that the correlation of INSTRUCTIONAL communication with on-task behavior was .835, $p < .01$. This correlation was significant and in the expected direction. Additional correlations for

TABLE XI

CHILD ON-TASK FREQUENCIES* AND PROPORTIONS BY TEACHER

TEACHER	MEAN FREQUENCIES	PROPORTIONS
1	279.33	.776
2	234.20	.651
3	231.50	.643
4	246.67	.685
5	297.77	.827
6	245.00	.680
7	259.33	.720

* The frequencies used are mean frequencies derived by dividing actual frequencies by the number of children for each teacher.

TABLE XII

TEACHER COMMUNICATION FREQUENCIES AND CHILD ON-TASK PEARSON CORRELATIONS

COMMUNICATION CATEGORY	r VALUES
INSTRUCTIONAL	.835 p <.010
REACTIONAL	.513 p <.119
INFORMAL	.274 p <.276
MANAGERIAL	-.086 p <.427
TOTAL	.688 p <.044

REACTIONAL, INFORMAL, and MANAGERIAL communications were not significant. TOTAL communications had a correlation with on-task behavior of .688, $p < .04$. These data are reported in Table XII.

It was expected that an examination of reactional communication, given the plethora of research supporting the relationship between reinforcement communication and attention, would yield a significant correlation. This hypothesis was not supported by these findings. Additionally, it was conjectured that the teachers' informal talking and managerial communications, such as punitive remarks, would be negatively correlated with the child's attention. No evidence was found to support that premise.

Patterns in Communication

To determine if there were patterns of teacher communication, irrespective of quantity, which are related to the child's on-task behavior, proportions of communications by category were obtained for each teacher (Table XIII). Pearson Product Moment Correlations using the mean proportion of ON-TASK behavior as the dependent variable (Table XIV) were obtained. None of these correlations were significant. If one assumes that proportions of communications by category might be indicative of teacher interaction or communication "style" and this

TABLE XIII

TEACHER COMMUNICATION PROPORTIONS BY CATEGORY

COMMUNICATION CATEGORY	TEACHER						
	1	2	3	4	5	6	7
INSTRUCTIONAL	.429	.533	.494	.502	.639	.458	.472
REACTIONAL	.322	.253	.263	.243	.222	.249	.220
INFORMAL	.229	.170	.196	.176	.104	.241	.230
MANAGERIAL	.019	.044	.047	.079	.035	.051	.078

TABLE XIV

TEACHER COMMUNICATION PROPORTIONS AND ON-TASK BEHAVIOR PEARSON CORRELATIONS

COMMUNICATION CATEGORY	r VALUES
INSTRUCTIONAL	.393 p <.192
REACTIONAL	.021 p <.482
INFORMAL	-.386 p <.196
MANAGERIAL	-.420 p<.174

"style" might be related to attention, no support for this concept or the relationship is found here.

In summary, inspection of this communication data suggests that a child's attention to prescribed tasks is positively and significantly related to the amount of instructional communication levied by the teacher. Additionally, it appears that instructional communication is the area of communication most related to the child's attentional process. Indeed, no evidence linking other types of teacher communication to children's attention behavior were found in this study.

SUMMARY OF THE RESULTS

The results of examining the relationship of LESSON TYPES and ON-TASK behavior indicate that a relationship does exist between the six lesson types and the attention behavior of children in these lessons. The findings suggest that lessons can be categorized according to the lesson property of "signal systems" and that these signal systems are predictive of a child's behavior within the lessons.

In the analysis of CLASSROOM MILIEU variables, the results of the teacher role, ownership of task, pupil interaction, and source of pacing comparisons were inconclusive. Though some differences between the categories for ON-TASK behavior were noted, the lack of variation makes the use of summary coding methods suspect.

The analysis of the milieu variable of teacher-child ratio showed that there was a significant relationship between the three ratio groups observed (1:1, 1:2, and 1:3) and the on-task behavior of the children in these groups. Children in a teacher-child ratio group of 1:1 were considerably and significantly more on task than the other two groups. No differences were noted between the 1:2 and the 1:3 ratio groups.

The results of the TEACHER COMMUNICATION analysis suggests that the amount of a teacher's instructional communication is positively related to the on-task behavior of the children with whom that teacher works. The other types of communication -- reactional, informal, and managerial -- were not shown to be related to on-task behavior. Additionally, the relative proportions of teacher communications by category, a measure more indicative of teacher communication "style", were not found to be related to the on-task behavior of these learning disabled children.

Table XV presents a summary of the results given in Chapter Four and notes the status of each tested hypothesis.

The final chapter presents the implications of these findings, discusses the general significance of this research and makes recommendations for further research in the areas of attention, task engagement, and attentional deficits of learning disabled children.

TABLE XV

SUMMARY OF RESULTS

HYPOTHESIS	TEST METHOD	STATUS (+)	 (*)	 (-)
A significant relationship exists between the six LESSON TYPES and task-related behavior.	Chi Square (Mantel-Haenzel technique)	✓		
LESSON TYPES 1,2,3 (with single, continuous signal systems) differ from LESSON TYPES 4,5,6 (with multiple, shifting signal systems) in On-task behavior	Proportions Test (Fleiss, 1973)	✓		
Differences in On-task behavior would be observed for different TEACHER ROLES, OWNERSHIP OF TASKS, PUPIL INTERACTIONS, and SOURCES OF PACING	Descriptive			✓
A significant relationship was found for the three TEACHER-CHILD RATIO groups 1:1, 1:2, 1:3 and On-task behavior	ANOVA and Tukey's Multiple T tests	✓		
Quantity of teachers' INSTRUCTIONAL Communication is positively and significantly correlated with children's On-task behavior	Pearson Product Moment Correlation Analysis	✓		
Quantity of teachers' REACTIONAL Communication is positively and significantly correlated with children's On-task behavior	Pearson Product Moment Correlation Analysis			✓
Quantity of teachers' INFORMAL Communication is negatively and significantly correlated with children's On-task behavior	Pearson Product Moment Correlation Analysis			✓

TABLE XIV (Continued)

HYPOTHESIS	TEST METHOD	STATUS		
		(+)	(*)	(-)
Quantity of teachers' MANAGERIAL communication is negatively and significantly correlated with children's On-task behavior	Pearson Product Moment Correlation Analysis			✓
Quantity of teachers' TOTAL communication is positively and significantly correlated with children's On-task behavior	Pearson Product Moment Correlation Analysis		✓	
A significant relationship exists between the proportions of the four TEACHER COMMUNICATION categories and On-task behavior	Pearson Product Moment Correlation Analysis			✓

(+) Hypothesis supported
(*) Hypothesis supported with qualification $.01 < p < .05$
(-) Hypothesis not supported

CHAPTER FIVE

CONCLUSIONS

This final chapter presents conclusions based on the review of the relevant literature in Chapter I and II and the findings reported in Chapter IV. The discussion of these conclusions are divided into 1) the general significance of this study for the education of learning disabled children, 2) the specific implications of the findings for the remediation of attentional deficits in learning disabled children, and 3) further research directions.

General Significance Of The Findings

On the basis of evidence reviewed in the literature related to learning disabilities and attentional deficits, it may be concluded that there is wide agreement that inattention or poor task engagement is the cardinal symptom of learning disabilities (Douglas, 1974; Dykman, et al., 1971). Its primary status among symptoms of learning disabilities makes it highly suspect for being the major determinant of school failure.

A major value of this study resides in its attempt to describe the situations, within the behavior setting of a resource room, which promote or discourage the attention of the learning disabled children in the situations. Though the average learning disabled child was observed to be on-task about 70% of the time during the actual formal lessons, the range was from 35% to 95%. Clearly, a child who is engaged in a lesson 35% of the time cannot learn very much. Moreover, these special remedial services are mandated not only to teach the child the material appropriate for his or her peers to know, but to remediate the learning habits associated with the previous failure. If these special services--with their extra resources, highly trained instructors, and low teacher-child ratios--cannot maintain a child's attention for more than 35% of the formal instruction time, implications for changes within those services are noteworthy. Let us discuss these implications measure by measure.

Lesson Types

Given the absence of consistency between the same children's on-task behavior in one lesson and on-task behavior in another and the absence of age, sex, race, IQ, or achievement differences in on-task behavior, the evidence is strong for the conclusion that a learning disabled child's attention is influenced more by the ecological context of the lesson than by these within-in child characteristics. It may be reasonable to view the child's task engagement more as a function of the lesson than of the child's "attention span."

The broad implication of viewing the task as, in fact, responsible for maintaining a child's attention is that we, as psychologists and educators, will devote less effort to the pursuit of within-child characteristics and concentrate more on the nature of the task and what techniques are required to program and manage different kinds of tasks.

Previous research (Kounin, 1977; Kounin and Gump, 1974; Kounin and Doyle, 1975; Rosenthal, 1973; Davenport, 1976) supports a task taxonomy which expects a child to be most engaged in an individual construction task. The learning disabled child, in this study, was not as engaged in this type of task as he was in listening under the head phones or in a 1:1 recitation with the teacher. In trying to understand why this finding was contrary to previous research, this investigator pieced together, from the reconstruction of incidences noted during observations, evidence for alternative explanations.

The child in an individual self construction/manipulation lesson did not behave as expected (i.e., was off-task) when:

1) The child finished a task and no directions had been given to the child to redirect any further activity.
2) The child was stalled because he or she did not know how to do the task or it was too difficult.
3) The props did not work (e.g., the scissors did not cut the burlap letters as assigned by the teacher).
4) The child was required to repetitively practice an action (e.g., copying a letter or number over and over) without any particular end product.

Though normal children were probably vulnerable to these same failures in the self-construction tasks, perhaps the learning disabled child, with a propensity for inattention, is more vulnerable and, hence, less able to do independent work when these tasks failures occur.

Functional taxonomies of tasks could very well supplement the plethora of taxonomies of child characteristics so prevalent in the area of learning disabilities. We need to develop classifications of lesson types which match characteristics of learning disabled children if we are to create trully appropriate educational remediations for them.

Classroom Milieu

The issue of the most efficient and/or most cost beneficial instruction ratio within the resource room has become seriously debated since the legislative mandate of "appropriate" educational services for all handicapped children (PL 94-142). Evidence exists that suggests that a 1:1 teacher-child ratio is the most efficacious for learning disabled children in terms of overall achievement gains (Moody, Bausell, and Jenkins, 1973; Jenkins and Mayhall, 1976). The findings of this study support Jenkins' conclusion, "...the greatest loss occurs as the instruction ratio changes from a 1:1 tutorial setting to the smallest group setting 1:2." While this study did not address the issue of efficacy of the intervention for producing gains in achievement, children seen in an instructional setting of 1:1 evidenced more on-task behavior than did children seen in small group settings. These data argue strongly for the provision of individual instruction to learning disabled children.

The nature of special education service delivery systems is such that no full-scale alterations in the case loads and allocations of services, which would allow a 1:1 instruction ratio, are soon to be forthcoming. With the requirements that services be provided to all exceptional children, many of whom have never received services, coupled with other increases in remedial programs mandated by competency testing legislation (Gallagher and Ramsbotham, 1978), it is not likely that reducing the teacher-child ratio in resource rooms will be a high priority for special educators in the near future.

Additionally, the issues of duration of services, times per week, and length of intervention effect the teacher-child ratio question. Research on these related issues is inconclusive--and policy decisions affecting their administration are yet unmade.

The major implications from the findings on teacher-child ratio and lesson types are that, if a teacher cannot provide services for each child on a 1:1 ratio, it would be effective to:

1) pair one child who can work well on individual self-construction/manipulation lessons or self-administered listen/monitor lessons with another child who would be in 1:1 recitation with the teacher;
2) group together for small group work children who can function the greatest percentages of time on-task in a multiple recitation session.

From observations in this study, it seems that most group composition is made administratively more on the basis of the child's age or grade level than on the child's behavioral or academic competencies. To provide the most appropriate services for these learning disabled children, this practice should be changed.

Teacher Communication

The findings of the present study indicate that teachers do show objective and quantifiable characteristics in terms of the quantity and structure of their communications to children and, in some cases these communications are related to the task engagement of the children they instruct.

This study's finding that the quantity of instructional communication was related to on-task behavior corroberated earlier findings (Walker, 1968; Englemann, 1969; Wood, 1975; Berliner, 1977) which showed that higher frequencies of instructional communication facilitated both attention and achievement.

Englemann (1969), for a decade, has advocated remedial instruction in which a teacher questions and prompts a child for an instructional response from 85-90% of a 20 minute lesson period. Such highly intense recitation sessions demand detailed planning, committment to sequenced systematic instruction, and a high energy level on the part of the instructor. This investigator observed only one teacher in this study who approached Englemann's model. This teacher had a child average on-task behavior of 83%, the highest of the seven teachers.

The literature related to instructional pace is pertinent here. Though this study did not attempt to measure actual pace of presentation or communication, the frequency of instructional communication could be seen as a gross measure of pace. If a faster pace increases a child's attention and decreases inattention (Carnine, 1976; Grobe and Pettibone, 1975; Cohen, 1968), then it is reasonable that a higher frequency of instructional communication may be responsible for "keeping up the pace."

It was expected in this study that the findings would show a relationship between reactional communication (reinforcement and praise) and attention. In fact, no relationship was evidenced. Douglas (1974) warns that verbal reinforcement facilitates attention to a task when it is associated with specific contingencies in a learning situation, but promotes irrelevant motor responses in learning disabled children when it is not specific. It was noted by this investigator, in the population observed, that nonspecific reinforcement statements may actually have inhibited attention to task. For example when a child was working on a self construction/manipulation task and a teacher reinforced the child with such general comments as "You are working so well, Michael!"—it was not uncommon for the child to be interrupted and to begin to fidgit noticeably. This observation lends credence to the behavioristic training models of Walker and Hops (1975) and Cobb and Hops (1972) which require that teacher reinforcement be "highly descriptive and very specific."

More research is needed concerning the effects of reinforcement communication upon attention behavior of children. Much research supports a relationship between these two variables, but few defensible controlled studies look primarily at reinforcement (or praise) and its impact on attention--and fewer still examine the differences in the specificity of those communications. It was a shortcoming of this study to have examined reactional communication and to have not examined these distinctions in types of reinforcement communications.

Methods

This research borrowed both its methodology and its conceptual formulations from an ecological model. First, it has demonstrated that meaningful variables can be studied by examining the transactions of the actual behavior setting of the resource room. Secondly, it has proved to be a fruitful methodology for the study of children naturalistically rather than as "subjects in an experiment." Thirdly, the committment to "completeness" of ecological methods made this study bigger, more difficult, and more time consuming than a tightly controlled manipulation of events in a laboratory, but the study yielded data that could not be obtained otherwise.

Specific Implications for Remediation of Attentional Deficits

Historically, there have been a number of approaches to remediation of problems of attention. Some have involved efforts to bring about changes within the child, others have focused primarily on modification of the learning environment, and others have attempted to alter the task to maximize a child's attention. Additionally, some of these approaches have been viewed as interactive, have been combined, and have been attempted in "model" remediation programs. All of the approaches have as their goal--ultimately to increase the child's attention to learning tasks in the classroom.

Much of the work over the last decade, and much of the most highly funded research in the area of remediation of attentional deficits has been drug therapy related (Harris, 1976; Sprague, et al., 1960; Bradley, 1978; Sykes, et al., 1971; Douglas, 1974). This research has produced conflicting findings on the effectiveness of this therapy (Alabiso, 1972; Freeman, 1966; Millichap, 1968; Sykes, et al., 1971; Douglas, 1974). Parents and professionals have become critical of the deleterious side effects of the drugs and the unpredictability of the reaction of individual children to the drugs (Ladd, 1970). As a result, alternative approaches for promoting attention are being sought by educators.

Task Modifications

Modification of the task is the more parsimonious and direct approach to ameliorating attention problems in learning disabled children--as it is within the control of the educators directing the services. Focusing on this remediation approach shifts the responsibility for remediation from the child to the service providers, where it logically should be. To infer that the learning disabled child can not learn, that he or she has an underlying attentional disorder, and that this attentional deficit is the fault of the child, is to "blame the victim" (Ryan, 1975) as well as to do disservice to the child. It seems more productive, argues Keogh and Margolis (1976)

> "...to approach difficulties in maintaining attention as evidence of lack of an appropriate match between the child and the assigned lesson, and to attempt to modify aspects of the task to improve the child's ability to sustain attentional efforts." (p. 25)

This study found that there was a significant relationship between the six lesson types observed and task-related behavior of children in those lessons. In terms of the effectiveness of certain types of lessons with learning disabled children, this study added support to earlier research which showed that some lesson types maintain the child's attention more consistently than others (Kounin and Gump, 1974; Rosenthal, 1973; Kounin and Doyle, 1975; Davenport, 1976).

In this study, certain lesson types appeared clearly more effective than others for producing on-task behavior in certain children. Self-Construction/Manipulation, Listen/Monitor, and 1:1 Recitation were demonstrably superior to Multiple Recitation or Play-Interact lesson types.

Listen/Monitor type of lessons--when a child was working with a record or tape player, listening under the headphones, or observing the teacher demonstrate--were highly successful for holding the children's attention but were seldom used.

Multiple Recitation sessions--when a child was in a recitation with one or more other children--produced such low task engagement for some children that their utility for remediation is highly questionable. The Play/Interact lesson types--when a child was involved in an activity such as a learning game--were described by the teachers as being "motivators" and of "high interest" for the children. These activities, however, promoted much off-task behavior for some children.

Transition, the category used to describe the time within the formal lesson that the activity was in the process of being changed, was seen in this study to clearly encourage off-task behavior. For some children, there were as many as 15 transitions, of 20 seconds or more, during a 20 minute lesson. Though the technique of having many short learning activities and skipping from one to another may work to maintain attention to "Electric Company," the children's television show, (Rust, 1973; O'Bryan, 1973), the technique is less effective, or at most, less manageable, in the resource room. For most learning disabled children, more continuous, smoothly flowing lessons with minimal transitions between tasks are recommended.

Task modifications, addressed by this study, include those related to task structure and methods. First, the lesson type analysis suggests that, in Self Construction/Manipulation lessons, ordered, sequenced tasks with defined outcomes should be used (Scott, 1978; Keogh, 1976; Meichenbaum, 1975; Haring and Krug, 1975; Patterson and Mischel, 1975).

Second, Listen/Monitor type lessons could be used to more advantage, because they show high percentages of on-task behavior--e.g., teacher modeling and demonstration of both task manipulation and appropriate behavior, recommended by Meichenbaum (1975), Bandura (1963), and Keogh (1976), would be appropriate techniques to promote attention. Additionally, recorded exercises for the child to use with headphones could prove to be successful "teacher extenders."

Third, these results suggest that basic manipulation tasks should be used in the initial learning of new tasks--i.e., a combination of the Self Construction/ Manipulation type and the 1:1 Recitation type would be appropriate at this time. Cawley and Pappinikou (1967) advocate a remediation direction of "do before see, see before say"--or manipulation before recitation. Campbell (1973) and Keogh (1976) both encourage increased explicity of task demands initially.

The fourth recommended task alteration is in the area of pace. Though pace was discussed earlier as a function of teacher communication, it is basically a task property. This research supports the findings of other investigators that faster paced recitations tend to hold the attention of children better than slower paced ones (Carnine, 1976; Cohen, 1968; Keogh and Margolis, 1976). A faster pace requires a teacher to ask more questions requiring more child responses.

Increases in child responses have been shown to produce more attention behavior in children by Adelman (1971).

Many of the recommendations generated from the basic research in attention have centered around the increase in the saliency of certain aspects of the learning materials. This has usually meant widespread use of colors, symbols, gadgets, special notations, etc. Though evidence does exist which supports the increase of visual, tactile and auditory stimulation within the learning materials, in the opinion of this author, too much emphasis has been placed on making the material more "attractive" to catch a child's attention--and too little emphasis has been placed on sustaining the child's attention to the task long enough to complete it.

Modification of Teacher Behavior

Implications for the modification of teacher behavior and communication can be concluded from the findings of this study. First, special education teachers need more skills in behavioral assessment. The teachers observed in this study could adequately give a battery of achievement and psycholinguistic abilities assessments, but they knew very little about the documentation of a child's behavior in the resource room or the regular classroom.

Second, teachers in the resource rooms need documentation of the child's behavior to make appropriate placement decisions for the learning disabled children they serve. Children should be placed in resource room settings which can maximize their on-task behavior, therefore, they should be paired with children whose remediation programs would be complementary. For example, children would not be paired for multiple recitation work who have high proportions of off-task behavior for that lesson type.

Third, teachers need to develop instructional skills which intensify 1:1 recitation drills. They should ask more questions and require more responses from the child. This type of intense instruction requires a committment to detailed planning and a high energy level on the part of the teacher.

Fourth, teachers using multiple recitation lesson formats need to structure the lesson to minimize the number of interruptions by faltering students or transition lag time.

Finally, special education teachers need better planning skills. Systematic, sequenced, intense instruction is the direct result of detailed planning. Without this planning many transitions, much lag time, more interruptions, and consequently, more children's inattention result.

In The Regular Classroom.

As indicated by the literature and by the results of this study, attention and attentional deficits in learning disabled children are complex phenomena. The variables that impact on attention in the resource classroom are numerous and their relationships to attention are often unclear. The number of variables affecting attention increase in the regular classroom. Regular classroom teachers can no longer ignore attentional problems. Nor can they send all children who are inattentive off to a special resource room. With the trend toward "mainstreaming" mildly handicapped children--i.e., maintaining them in the regular classroom--the regular classroom teachers may bear the main responsibility for teaching the learning disabled child with attentional deficits.

Some of the research findings of this study have direct implication for the regular class situation. First, when possible, learning disabled children should receive periodic tutorial recitation instruction with a 1:1 teacher-child ratio. This could be accomplished using:

a) Special education teachers in the regular classroom;

b) Competent and/or older children as tutors.

Second, these recitation lessons should be very systematic and intense. Third, when expected to work independently, the learning disabled child should be given:

a) Explicit instructions for beginning, doing, and finishing the task;

b) Tasks he or she is capable of doing;

c) Tasks with a visible end product.

Fourth, regular classroom teachers should take care that a fair and equitable share of their interactions are with their low achieving children. Fifth, reinforcement statements to the child during a formal lesson should be very specific reactions to the child's response and not general praise.

Finally, just as in the resource room, teachers should try to minimize the number and length of transitions between tasks for the learning disabled child. Transitions and lag time during formal lesson time creates a situation in which these children are vulnerable to off-task and even disruptive behavior.

Future Research Directions

Eight avenues of future research are recommended in the study of variables which impact on the attention of learning disabled children. Some of these recommended paths are more global and some are more specific.

First, more research is needed concerning the relationship of attention and school achievement. Previous studies have shown correlations between on-task behavior and academic performance, and much clinical evidence suggests that children with learning problems exhibit more problems of attention than do normal children. However, further research is needed to validate and clarify the nature of the relationship between attention and school achievement.

Second, there is a need for research on the different types of attentional problems. Confusion about the nature of the relationship between attention and school achievement may be due in part to the confusion over what behaviors constitute "attention." Attention should not, perhaps, be characterized by a single response mode as "task engagement" or "on-task behavior" but rather as many response modes involving "coming to attention" and "maintaining attention" and "focusing on the relevant stimuli." On the basis of the research done here, it seems likely that there is some unity in the various aspects of attention, but it is possible that certain components of attention, i.e., "coming to attention" at the beginning of the task, may have been especially powerful in particular situations or on particular tasks.

Third, some of the findings regarding the effects of certain formal lesson types on the child's on-task behavior are highly provocative. The findings in this study are preliminary, but fruitful in suggesting that some lesson types promote attention in learning disabled children more than others. More research is needed to understand what properties of the lessons are the major promoters of the child's attention. For example, investigations of "signal systems" within lessons is a research path that should be pursued.

Fourth, research on the development of taxonomies of tasks is needed to supplement existing taxonomies of child characteristics. As Cronbach and Snow argue (1977), taxonomies of tasks are necessary in order to match appropriate learning tasks with the characteristics of the learning disabled children to optimize the remedial services.

Fifth, during this study it became obvious to the author that lesson formats were clearly related to dimensions of teaching behavior. For example, 1:1 recitations required different teacher actions than multiple recitations. More research is needed to examine the effectiveness of specific teacher behaviors within the lesson format in which they occur.

Sixth, further research in the area of teacher communication is needed to determine the relationship between certain types or patterns of communication and the child behaviors that teacher communication foster. To understand the relationship between student learning and teacher communications, it will be necessary:

a) to develop better classification systems for teacher communication than are presently available in the literature;

b) to examine in more detail the relationship of a teacher's instructional communication and a child's resulting behavior.

A positive correlation was found in this study between instructional communication and the child's on-task behavior, but instructional communication is, itself, sufficiently complex to warrant further research.

Additionally, in the area of teacher communication, more investigation is needed to determine what type and what schedule of verbal reinforcement is most effective with what lesson formats and with which children. Behavioral management advice of using a 100% reinforcement schedule with learning disabled children or a sympathetic teacher's inclination to lavish praise on a child with the intent to motivate him, may not be effective reinforcement strategies.

Seventh, psychometric research design and statistical methodology are presently inadequate to meet the needs of large, naturalistic, observational studies similar to this one. When the same child is observed over long periods of time and in classroom situations in which he may or may not be exposed to every type of observed setting variable within that time, the data is subject to conservative statistical constraints which may cloud the issues.

Some ecological psychologists have resorted to narrative specimen records, which are similar to anthropological field study records, to arrive at the completeness called for by the ecological perspective (Scott, 1978). However, these records are cumbersome, expensive to collect and process, and dependent on much subjective reinterpretation. Alternatives, such as the potpourri of analyses and procedures used in this study, represent attempts to be more systematic and objective than specimen records would permit.

Because it is critical that researchers in education examine what is actually going on in a learning environment to determine which variables are producing a successful or unsuccessful outcome for a child, it is imperative that methodology, beyond the intuitive descriptive stage, be developed. More research in the development of appropriate methodology is clearly necessary.

Summary Statement

Evidence reviewed and presented in this study provides sound basis for viewing the problems of attention as instrumental in the learning failure of many learning disabled children. Keogh and Margolis assert that it is likely that one of the powerful effects of schooling is to socialize the child to perform adequately on many different tasks in many different situations. This competence demands the deployment of attention. The child not only learns to read and multiply in school, but he learns to direct and maintain his or her attention toward a task to be accomplished. These attentional demands are made upon every child, though some children meet them better than others.

Problems in attention are not new nor are they peculiar to learning disabled children alone. Children around the world demonstrate the proclivity for day dreaming in school. The most often heard command of the German classroom teacher exhorting the child to pay attention, is "Hor gut zu!" A Samoan child will receive a small pebble upon the head for his staring at the sea rather than at his copy board, and praised with "malo le onosai'i" for his working patiently. Children with learning disabilities are characteristically unable to "pay attention" persistently or "work patiently"--yet these abilities are critical to school performance. This examination of attention and the variables which influence it may help define special educational remediations which will facilitate this important child behavior.

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APPENDICES

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LESSON CHILD MILIEU

CONSTRUCT	LISTEN/MONITOR	RECITE (T-C)	RECITE (T-C2)	PLAY/INTERACT	TRANSITION		ON-TASK	OFF-TASK	INAPPROP.
1	2	3	4	5	6	00	☐	☐	☐
1	2	3	4	5	6	10	☐	☐	☐
1	2	3	4	5	6	20	☐	☐	☐
1	2	3	4	5	6	30	☐	☐	☐
1	2	3	4	5	6	40	☐	☐	☐
1	2	3	4	5	6	50	☐	☐	☐
1	2	3	4	5	6	00	☐	☐	☐
1	2	3	4	5	6	10	☐	☐	☐
1	2	3	4	5	6	20	☐	☐	☐
1	2	3	4	5	6	30	☐	☐	☐
1	2	3	4	5	6	40	☐	☐	☐
1	2	3	4	5	6	50	☐	☐	☐
1	2	3	4	5	6	00	☐	☐	☐
1	2	3	4	5	6	10	☐	☐	☐
1	2	3	4	5	6	20	☐	☐	☐
1	2	3	4	5	6	30	☐	☐	☐
1	2	3	4	5	6	40	☐	☐	☐
1	2	3	4	5	6	50	☐	☐	☐
1	2	3	4	5	6	00	☐	☐	☐
1	2	3	4	5	6	10	☐	☐	☐
1	2	3	4	5	6	20	☐	☐	☐
1	2	3	4	5	6	30	☐	☐	☐
1	2	3	4	5	6	40	☐	☐	☐
1	2	3	4	5	6	50	☐	☐	☐

TEACHER ROLE

___ Instructor/Reader
___ Recititation Leader
___ Participator
___ Helper
___ Onlooker

PUPIL ACTIVITY

___ Own task : no product
___ Own task : product
___ Group task : no product
___ Group task : product

PUPIL WORK INTERACTION

___ Interdependent
___ Private
___ Parallel

ACTION SEQUENCING

___ Self-pacing
___ External pace: no performance
___ External pace: performance

APPENDIX B

LESSON TYPES PROTOCOL	(Adapted from Kounin and Gump, 1974)
SELF-CONSTRUCTION/MANIPULATION	-Major signals come from materials/props; -Child manipulates props (must have so that he/she can use the them) -Child's actions produce a visible effect which signals further action; -Child organizes materials as assigned; -e.g. C copies writing samples; C constructs sheet of words beginning with a letter;
LISTEN/MONITOR	-Major signals from external, continuous source like teacher or reading machine; -e.g. T conducts demonstration; T reads to C; C under headphones of tape player;
RECITATION 1:1	-Teacher sequences and paces signals to individual child; -Major signals from T, but C may use props; -e.g. T drilling C in math facts;
MULTIPLE RECITATION	-Teacher recitation focuses on more than 1 child; -Teacher questions more than 1 child at a time; -Major signals shared between T and C's (multiple) -e.g. T asking questions of C's in a small group about story she just read;
PLAY/INTERACT	-Major singlas are shared by T and C's(multiple) or just C's; -e.g. follow-up game; group construction;
TRANSITION	-Signals are unclear or "off" -e.g. Lag time; interruptions; Post-task completion time;

APPENDIX C

CLASSROOM MILIEU PROTOCOL

(Adapted from Morrison and Oxford, 1977)

TEACHER ROLE

Leader	-Teacher is instructor or lecturer; -Teacher demonstrates or gives factual information; -Teacher gives directions;
Participator	-Teacher does activity along with child; -Teacher is coplayer in learning game;
Helper	-Teacher is rotating among C's answering questions or helping; -C is working alone,but signals for help;
Onlooker	-Teacher is on the periphery of activity but attending C;

OWNERSHIP OF TASK

Own task: no product	-Child works with own material at desk; -No visible product made; -e.g. C reading
Own task : product	-Child works with own material at desk; -Child works in workbook,writes;
Group task : no product	-Children listen or watch -No visible product made;
Group task : product	-Child works in group: -Child may have own product related to the group work; -e.g. group construction group game

PUPIL WORK INTERACTION

Interdependent	-Child will mesh activities with other children;

(cont.)

(cont.)

Private	-Child works on private activity, whether or not the child is sitting in a group;
Parallel	-C watching, listening with other children in room;
SOURCE OF PACING	
Self-source pacing	-Child executes task as own readiness dictates -e.g. C reading to self C working in workbook
External-source pacing	-Teacher cues child response; -Mechanical device cues child response; -e.g. C being drilled by T

APPENDIX D

TEACHER COMMUNICATION PROTOCOL

(Adapted from Jackson and Lahaderne (1967)
and Wright and Nuthall (1970))

INSTRUCTIONAL	
Structuring	-T supplies information before or after C response; -T supplies directions; -Code 1 time every 10 seconds if monologue;
Soliciting	-T statement intends to elicit verbal response or physical response from C;
Reciprocating	-T responds to C's instructional question;
REACTIONAL	
Praising or Thanking	-T positively reinforces C's response or performance;
Challenging	-T negatively reinforces C's response or performance; -T contracting negatively with statement "If you do.."
INFORMAL	
Indefinite commenting	-T commenting to C with no intent; -Non-judgemental rapping; -Teacher thinking aloud;
Talking informally	-Teacher talks unrelated to school or task; -Shooting the breeze with C;
MANAGERIAL	
Interpreting rules	-T clarifies any non-task rules; -Discussing grades/charts;
Ordering/Punishing	-T punishes C or group; -T deals with misbehavior;

TEACHER→CHILD COMMUNICATION

C ID NUMBER ☐☐☐

DATE ☐☐

CODER ☐☐

VISIT 1 2 3

T ID NUMBER ☐☐☐

T/C RATIO
___ 1:1
___ 1:2
___ 1:3

Notes: ____________________
____
____
____

CATEGORIES	TALLIES S	TALLIES G	TOTALS	%
INSTRUCTIONAL			Inst. TOT.____	____
Structuring			____	
Soliciting			____	
C Response:			w/res. ☐ w/out re ☐	
Reciprocating			____	
C Quest's:			reg. rec ☐	
T Response:			res.to Q ☐	
INFORMAL INTERACTION			Inf. TOT____	____
REACTIONAL			Reac. TOT____	____
Praising/thanking / R^+			____	
Challenging/ R^-			____	
Indefinite comment (repeat/"OK")			____	
MANAGERIAL			Man. TOT____	____
Interpreting rules			____	
Ordering/commanding			____	
Punishing			____	
	TOT____	TOT____	TOTAL____	

APPENDIX F

CHILD BEHAVIOR PROTOCOL

ON-TASK	-Child is clearly engaged in the official, assigned task; -Child is engaged in a manner appropriate to the lesson; -Engagement may be passive: e.g. listening -Engagement may be active; e.g. reading, responding
OFF-TASK	-Child is not engaged in the assigned task; -Child showns no signs of misbehaving or being inappropriately engaged in another activity;
INAPPROPRIATE	-Child is involved in an unofficial, unassigned activity; -Child is involved in a deviant behavior; -Performing poorly or making errors is not coded as inappropriate engagement. -e.g. drawing on notebook; interferring with ongoing lesson; exhibiting aggression toward another child; inappropriate help-seeking;

APPENDIX G

CORRELATIONS OF POPULATION CHARACTERISTICS WITH ON-TASK BEHAVIOR
PEARSON CORRELATIONS

(N=35)

SEX *	$\underline{t} = 1.70$	$p < .098$
RACE *	$\underline{t} = 0.66$	$p < .515$
AGE	$\underline{r} = .0903$	$p < .303$
IQ	$\underline{r} = .2546$	$p < .100$
ACHIEVEMENT (TOTAL)	$\underline{r} = .2449$	$p < .060$
ACHIEVEMENT (READING)	$\underline{r} = .2416$	$p < .080$

* T tests were used to compare these dichotomous variables;
** All other analyses were Pearson Correlation Analyses;